Nokia Customer Care

Service Manual

RM-470 (Nokia 6700 classic; L3&4)
Mobile Terminal
Part No: (Issue 1)

COMPANY CONFIDENTIAL

NOKIA
Care

Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Issue 1	04/2009	NS	

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The availability of particular products may vary by region.

IMPORTANT

This document is intended for use by qualified service personnel only.

Warnings and cautions

Warnings

- IF THE DEVICE CAN BE INSTALLED IN A VEHICLE, CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI-SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/ MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.
- THE PRODUCT MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, FOR EXAMPLE, PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
- OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.
- BEFORE MAKING ANY TEST CONNECTIONS, MAKE SURE YOU HAVE SWITCHED OFF ALL EQUIPMENT.

Cautions

- Servicing and alignment must be undertaken by qualified personnel only.
- Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
- Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
- Use only approved components as specified in the parts list.
- Ensure all components, modules, screws and insulators are correctly re-fitted after servicing and alignment.
- Ensure all cables and wires are repositioned correctly.
- Never test a mobile phone WCDMA transmitter with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.
- During testing never activate the GSM or WCDMA transmitter without a proper antenna load, otherwise GSM or WCDMA PA may be damaged.

For your safety

QUALIFIED SERVICE

Only qualified personnel may install or repair phone equipment.

ACCESSORIES AND BATTERIES

Use only approved accessories and batteries. Do not connect incompatible products.

CONNECTING TO OTHER DEVICES

When connecting to any other device, read its user's guide for detailed safety instructions. Do not connect incompatible products.

Care and maintenance

This product is of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfil any warranty obligations and to enjoy this product for many years.

- Keep the phone and all its parts and accessories out of the reach of small children.
- Keep the phone dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the phone in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the phone in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store the phone in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- Do not drop, knock or shake the phone. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the phone.
- Do not paint the phone. Paint can clog the moving parts and prevent proper operation.
- Use only the supplied or an approved replacement antenna. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

All of the above suggestions apply equally to the product, battery, charger or any accessory.

ESD protection

Nokia requires that service points have sufficient ESD protection (against static electricity) when servicing the phone.

Any product of which the covers are removed must be handled with ESD protection. The SIM card can be replaced without ESD protection if the product is otherwise ready for use.

To replace the covers ESD protection must be applied.

All electronic parts of the product are susceptible to ESD. Resistors, too, can be damaged by static electricity discharge.

All ESD sensitive parts must be packed in metallized protective bags during shipping and handling outside any ESD Protected Area (EPA).

Every repair action involving opening the product or handling the product components must be done under ESD protection.

ESD protected spare part packages MUST NOT be opened/closed out of an ESD Protected Area.

For more information and local requirements about ESD protection and ESD Protected Area, contact your local Nokia After Market Services representative.

Battery information

Note: A new battery's full performance is achieved only after two or three complete charge and discharge cycles!

The battery can be charged and discharged hundreds of times but it will eventually wear out. When the operating time (talk-time and standby time) is noticeably shorter than normal, it is time to buy a new battery.

Use only batteries approved by the phone manufacturer and recharge the battery only with the chargers approved by the manufacturer. Unplug the charger when not in use. Do not leave the battery connected to a charger for longer than a week, since overcharging may shorten its lifetime. If left unused a fully charged battery will discharge itself over time.

Temperature extremes can affect the ability of your battery to charge.

For good operation times with Li-Ion batteries, discharge the battery from time to time by leaving the product switched on until it turns itself off (or by using the battery discharge facility of any approved accessory available for the product). Do not attempt to discharge the battery by any other means.

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

Do not short-circuit the battery. Accidental short-circuiting can occur when a metallic object (coin, clip or pen) causes direct connection of the + and - terminals of the battery (metal strips on the battery) for example when you carry a spare battery in your pocket or purse. Short-circuiting the terminals may damage the battery or the connecting object.

Leaving the battery in hot or cold places, such as in a closed car in summer or winter conditions, will reduce the capacity and lifetime of the battery. Always try to keep the battery between 15°C and 25°C (59°F and 77°F). A phone with a hot or cold battery may temporarily not work, even when the battery is fully charged. Batteries' performance is particularly limited in temperatures well below freezing.

Do not dispose of batteries in a fire!

Dispose of batteries according to local regulations (e.g. recycling). Do not dispose as household waste.

Company policy

Our policy is of continuous development; details of all technical modifications will be included with service bulletins.

While every endeavour has been made to ensure the accuracy of this document, some errors may exist. If any errors are found by the reader, NOKIA MOBILE PHONES Business Group should be notified in writing/e-mail.

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Nokia 6700 classic; L3&4 Service Manual Structure

1 General information
2 Service Devices and Service Concepts
3 BB Troubleshooting and Manual Tuning Guide
4 RF troubleshooting
5 System Module
Glossary

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1 — General information

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Product selection

RM-470 (Nokia 6700 classic) is a GSM/WCDMA dual mode phone, supporting EGSM850/900/1800/1900 and WCDMA bands I, II and VIII.

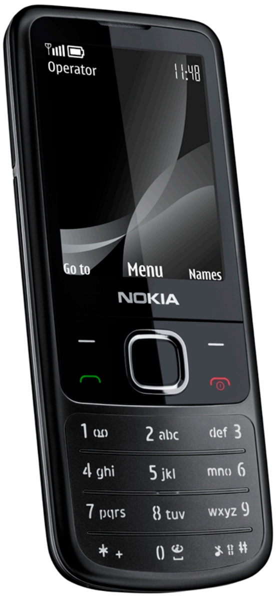

Figure 1 RM-470 (Nokia 6700 classic) product picture

Phone features

Display and keypad features

- 2.2" QVGA display with 16M colors
- 5-way Navi key (soft keys, send and end)
- Side-keys for volume up and down and camera capture

Hardware features

- Main camera: 5 megapixel camera with autofocus and integrated flash
- Internal GPS receiver
- MicroUSB connector/charger plug for data transfer (USB 2.0), charging and headset
- High speed USB (FS/HS/OTG)
- 2 mm charger plug interface
- Bluetooth version 2.1
- microSD memory card connector
- Stereo Music Player
- Integrated handsfree speaker
- Active noise cancelling (uplink)
- Internal vibra and antennas
- Plug-in SIM 1.8V and 3.0V, more than 1000 entries

RF features

- GSM/EDGE 850/900/1800/1900

- WCDMA band I, II and VIII
- High speed upload - HSUPA cat 5 (2.0 Mbps)
- High speed download - HSDPA cat 9 (10.2 Mbps)
- EDGE: MSC 32
- GPRS: MSC 32
- HSCSD, CSD for browsing and as data modem

Software and user interface features

Selection of software application and features

- OMA DRM 2.0 (Digital Rights Management)/Windows media DRM
- OMA MMS 1.3, MMS Conformance 3.0, AMR, and SMIL
- OMA Client Provisioning 1.1
- SyncML (local and remote)
- Java
- Music Player supporting MP3, MPEG4, AAC, eAAC+, WMA
- OMA DM 1.2 and FOTA with FUMO 1.0
- Calendar with today view in active standby mode
- Instant messaging
- VoIP
- Wideband AMR
- Nokia OSS Internet Browser
- Macromedia Flash Lite 3.0
- Nokia PC suite

Accessories

Sales package contents

- Nokia 6700 classic phone
- Nokia Battery BL-6Q
- Nokia High Efficiency Charger AC-8
- Nokia Wired Headset WH-203
- Nokia Micro USB Cable CA-101
- 1 GB MU-22 MicroSD card
- User Guide

Table 1 Battery and chargers

Type	Name
Note: This phone is charged through the smaller Nokia standard charger interface (2.0 mm plug). A 3.5 mm compatible Nokia standard charger can be used together with the CA-44 charger adapter.	
BL-6Q	Battery 960 mAh Li-Ion
AC-8	High efficiency charger
AC-6	USB charger

Table 2 Car accessories

Type	Name
CK-100	Bluetooth car kit
DC-9	Mobile charger
HK-510	Plug-In car kit with display and DSP

Table 3 Headsets

Type	Name
Wired	
WH-203	Stereo headset
Wireless	
BH-606	Bluetooth mono headset
BH-103	Bluetooth stereo headset

Table 4 Cables

Type	Name
CA-101	Micro USB cable

Technical specifications

General specifications

Unit	Dimension (mm)	Weight (g)	Volume (cc)
RM-470 transceiver with BL-6Q 960 mAh Li-Ion battery pack	109.8 x 45.0 x 11.1	116	46.5

Main RF characteristics for GSM850/900/1800/1900 and WCDMA band I, II and VIII phones

Parameter	Unit
Cellular system	GSM850, EGSM900, GSM1800/1900, WCDMA I (2100), WCDMA II (1900) and WCDMA VIII (900)
Rx frequency band	GSM850: 869 - 894 MHz
	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
	WCDMA I (2100): 2110 - 2170 MHz
	WCDMA II (1900): 1930 - 1990
	WCDMA VIII (900): 925- 960 MHz

Parameter	Unit
Tx frequency band	GSM850: 824 - 849 MHz
	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
	WCDMA I (2100): 1920 - 1980 MHz
	WCDMA II (1900): 1850 - 1910
	WCDMA VIII (900): 880 - 915 MHz
Output power	GSM850: +5 ...+33dBm/3.2mW ... 2W
	GSM900: +5 ... +33dBm/3.2mW ... 2W
	GSM1800: +0 ... +30dBm/1.0mW ... 1W
	GSM1900: +0 ... +30dBm/1.0mW ... 1W
	WCDMA I (2100): -50 ... +21 dBm/0.01μW ... 251.2mW
	WCDMA II (1900): -50 ... +21 dBm/0.01μW ... 251.2mW
	WCDMA VIII (900): -50 ... +21 dBm/0.01μW ... 251.2mW
Number of RF channels	GSM850: 124
	GSM900: 174
	GSM1800: 374
	GSM1900: 299
	WCDMA I (2100): 277
	WCDMA II (1900): 289
	WCDMA VIII (900): 152
Channel spacing	200 kHz
Number of Tx power levels	GSM850: 15
	GSM900: 15
	GSM1800: 16
	GSM1900: 16
	WCDMA I (2100): 75
	WCDMA II (1900): 75
	WCDMA VIII (900): 75

Battery endurance

Battery	Talk time	Standby time
BL-6Q 960 mAh Li-ion	GSM: up to 5 h WCDMA: up to 4 h	GSM: up to 416 h WCDMA: up to 480 h

Note: Variation in operation times will occur depending on SIM card, network settings and usage. Talk time is increased by up to 30% if half rate is active, and reduced by 5% if enhanced full rate is active.

Environmental conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-15 ºC ... +55 ºC	Specifications fulfilled
Reduced performance	55 ºC ... +70 ºC	Operational only for short periods
Intermittent or no operation	-40 ºC ... -15 ºC and +70 ºC ... +85ºC	Operation not guaranteed but an attempt to operate will not damage the phone
No operation or storage	<-40 ºC and >+85 ºC	No storage. An attempt to operate may cause permanent damage
Charging allowed	-15 ºC ... +55 ºC	
Long term storage conditions	0 ºC ... +85 ºC	
Humidity and water resistance		Relative humidity range is 5 to 95%. Condensed or dripping water may cause intermittent malfunctions. Protection against dripping water has to be implemented in (enclosure) mechanics. Continuous dampness will cause permanent damage to the module.

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2 — Service Devices and Service Concepts

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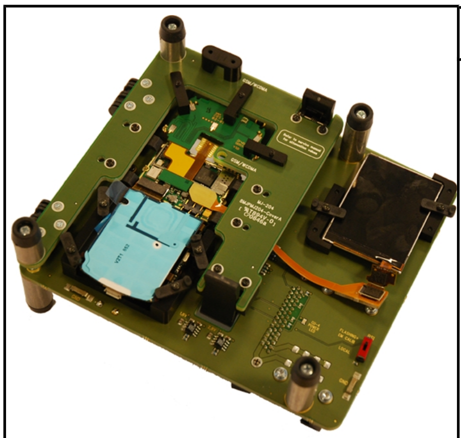
Service devices

Product specific devices

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-470. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

	FS-98	Flash adapter	
	• FS-98 is equipped with a clip interlock system • provides standardised interface towards Control Unit • provides RF connection using coupler • multiplexing between USB and FBUS media, controlled by VUSB		



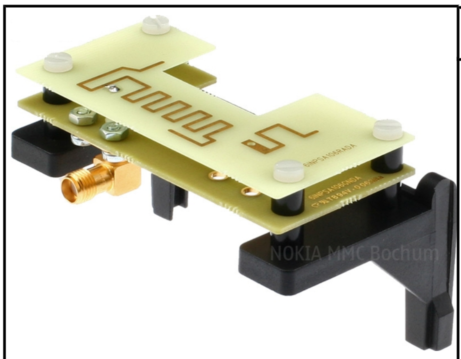
MJ-204	Module jig	

MJ-204 is meant for component level troubleshooting.

The jig includes an RF interface for GSM, WCDMA and Bluetooth. In addition, it has the following features:

- Provides mechanical interface with the engine module
- Provides galvanic connection to all needed test pads in module
- Multiplexing between USB and FBUS media, controlled by Vusb
- MMC interface
- Duplicated SIM connector
- Connector for control unit
- Access for AV- and USB connectors
-

Frequency	Attenuation. (dB)
GSM850 TX	-43.3
GSM850 RX	-39.5
GSM900 TX	-37.2
GSM900 RX	-31.8
GSM1800 TX	-34.0
GSM1800 RX	-29.2
GSM1900 TX	-28.3
GSM1900 RX	-27.0
WCDMA band I TX	-27.0
WCDMA band I RX	-23.8
WCDMA band II TX	-28.3
WCDMA band II RX	-27.0
WCDMA band VIII TX	-37.2
WCDMA band VIII RX	-31.8

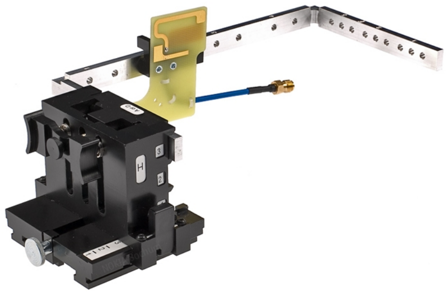


SA-106	RF coupler	

SA-106 is an RF coupler for WCDMA and GSM RF testing. It is used together with SS-62.

The following table shows attenuations from the antenna pads of the mobile terminal to the SMA connectors of SA-106:

Frequency	Attenuation. (dB)
GSM850 TX	Low:-10.4 Mid:-10.0 High:-10.0
GSM850 RX	Low:-9.0 Mid:-8.5 High:-8.5
GSM900 TX	Low:-8.5 Mid:-8.5 High:-8.5
GSM900 RX	Low:-8.5 Mid:-9.1 High:-10.0
GSM1800 TX	Low:-23.7 Mid:-20.0 High:-18.4
GSM1800 RX	Low:-18.0 Mid:-17.2 High:-16.7
GSM1900 TX	Low:-17.6 Mid:-16.7 High:-16.1
GSM1900 RX	Low:-15.8 Mid:-15.1 High:-14.3
WCDMA band I TX	Low:-15.9 Mid:-15.3 High:-14.7
WCDMA band I RX	Low:-12.3 Mid:-12.2 High:-12.6
WCDMA band II TX	Low:-17.5 Mid:-16.7 High:-16.1
WCDMA band II RX	Low:-15.8 Mid:-15.1 High:-14.3
WCDMA band VIII TX	Low:-8.5 Mid:-8.5 High:-9.2
WCDMA band VIII RX	Low:-9.0 Mid:-9.0 High:-9.0



SA-131	GPS RF coupler	

SA-131 is a RF coupler for GPS testing. It is used together with SS-62.

For more information on how to use the SA-131 with RM-470, see Using SA-131 GPS RF coupler with RM-470 (page 2–7).

SS-209	Camera removal tool	

Using SA-131 GPS RF coupler with RM-470

Use the following basic SA-131 setup for RM-470:

- 1575.520152 MHz
- -110 dbm
- 20 db fixed RF attenuator

- 22 db product specific RF attenuation

And use the following settings for the SA-131:

- Base setting: 3
- Sledge setting: 2
- Frame setting: A2
- Coupler setting: A2
- Direction: Down

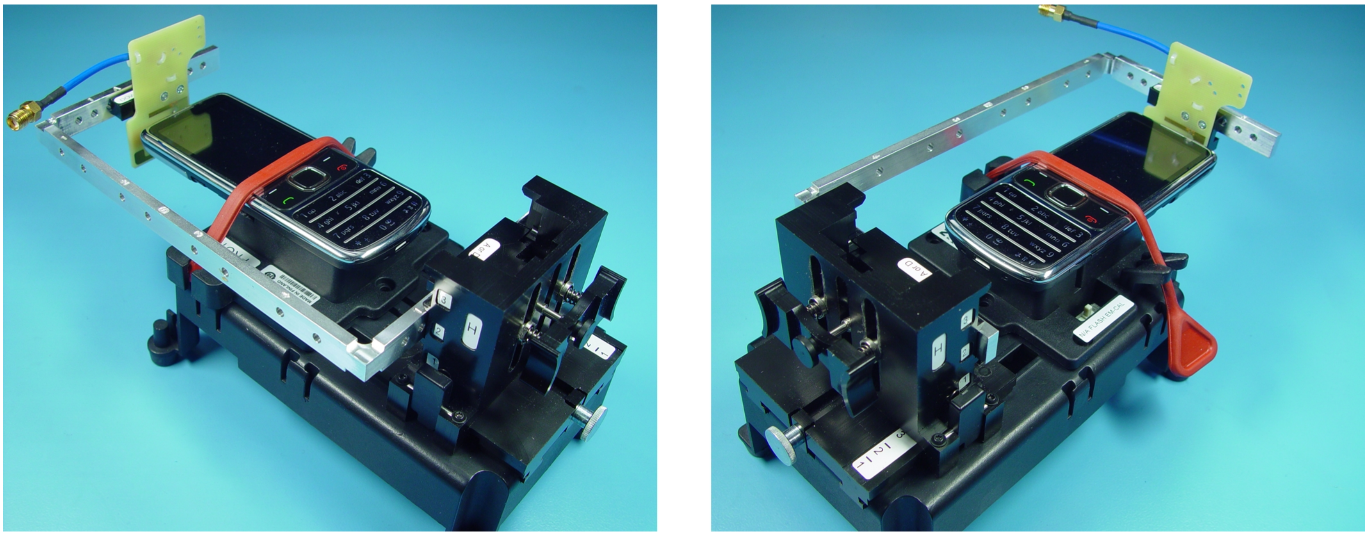


Figure 2 Using SA-131 with RM-470

General devices

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-470. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

CU-4

CU-4	Control unit	

CU-4 is a general service tool used with a module jig and/or a flash adapter. It requires an external 12 V power supply.

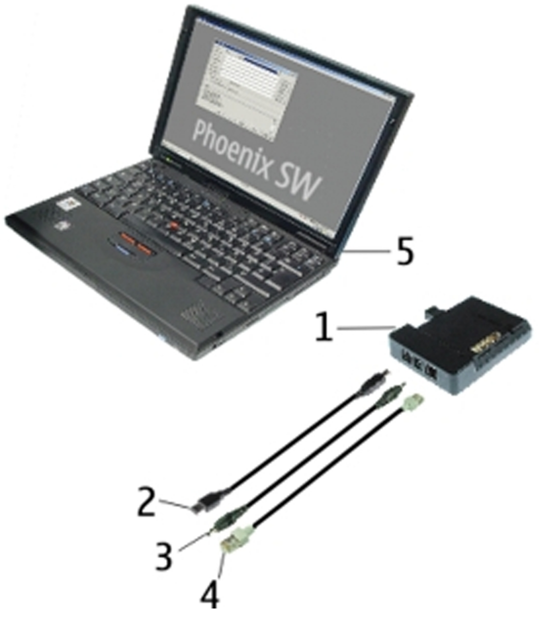
The unit has the following features:

- software controlled via USB
- EM calibration function
- Forwards FBUS/Flashbus traffic to/from terminal
- Forwards USB traffic to/from terminal
- software controlled BSI values
- regulated VBATT voltage
- 2 x USB2.0 connector (Hub)
- FBUS and USB connections supported

When using CU-4, note the special order of connecting cables and other service equipment:

Instructions

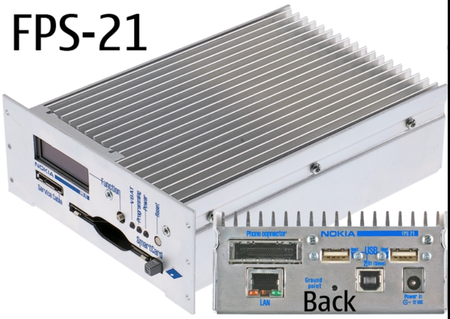
1. Connect a service tool (jig, flash adapter) to CU-4.
2. Connect CU-4 to your PC with a USB cable.
3. Connect supply voltage (12 V)
4. Connect an FBUS cable (if necessary).
5. Start Phoenix service software.



Note: Phoenix enables CU-4 regulators via USB when it is started.

Reconnecting the power supply requires a Phoenix restart.

<table>
<tr><td rowspan="2"> </td><td>FLS-5</td><td>Flash device</td><td></td></tr>
<tr><td colspan="3">FLS-5 is a dongle and flash device incorporated into one package, developed specifically for POS use.
Note: FLS-5 can be used as an alternative to PKD-1.</td></tr>
</table>



FPS-21	Flash prommer	

FPS-21 sales package:

- FPS-21 prommer
- AC-35 power supply
- CA-31D USB cable

FPS-21 interfaces:

Front

- Service cable connector

  Provides Flashbus, USB and VBAT connections to a mobile device.
- SmartCard socket

  A SmartCard is needed to allow DCT-4 generation mobile device programming.

Rear

- DC power input

  For connecting the external power supply (AC-35).
- Two USB A type ports (USB1/USB3)

  Can be used, for example, for connecting external storage memory devices or mobile devices
- One USB B type device connector (USB2)

  For connecting a PC.
- Phone connector

  Service cable connection for connecting Flashbus/FLA.
- Ethernet RJ45 type socket (LAN)

  For connecting the FPS-21 to LAN.

Inside

- Four SD card memory slots

  For internal storage memory.

  Note: In order to access the SD memory card slots inside FPS-21, the prommer needs to be opened by removing the front panel, rear panel and heatsink from the prommer body.

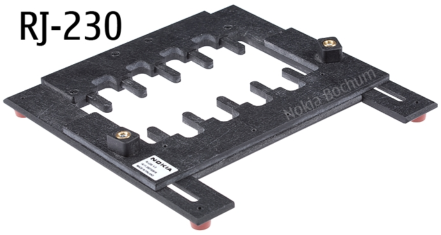
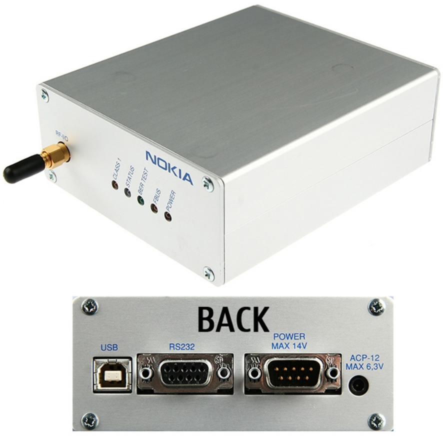
  Note: FPS-10 can be used for flashing instead of FPS-21 if necessary.

PK-1	Software protection key	

PK-1 is a hardware protection key with a USB interface. It has the same functionality as the PKD-1 series dongle.

PK-1 is meant for use with a PC that does not have a series interface.

To use this USB dongle for security service functions please register the dongle in the same way as the PKD-1 series dongle.

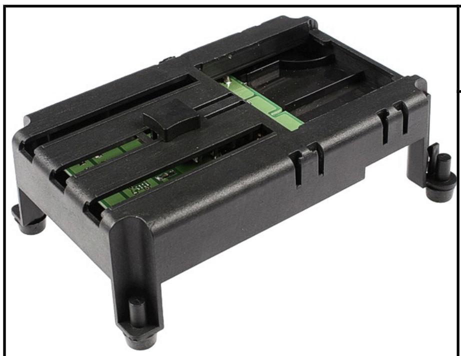
<table>
<tr><td rowspan="2"> </td><td>PKD-1</td><td>SW security device</td><td></td></tr>
<tr><td colspan="3">SW security device is a piece of hardware enabling the use of the service software when connected to the parallel (LPT) port of the PC.
Without the device, it is not possible to use the service software.
Printer or any such device can be connected to the PC through the device if needed.</td></tr>
<tr><td rowspan="2"> </td><td>RJ-230</td><td>Soldering jig</td><td></td></tr>
<tr><td colspan="3">RJ-230 is a soldering jig used for soldering and as a rework jig for the engine module.</td></tr>
<tr><td rowspan="2">

NOKIA
BACK
USB
RS232
POWER MAX 14V
ACP-12 MAX 6,3V

</td><td>SB-6</td><td>Bluetooth test and interface box (sales package)</td><td></td></tr>
<tr><td colspan="3">The SB-6 test box is a generic service device used to perform Bluetooth bit error rate (BER) testing, and establishing cordless FBUS connection via Bluetooth. An ACP-8x charger is needed for BER testing and an AXS-4 cable in case of cordless interface usage testing .
Sales package includes:
• SB-6 test box
• Installation and warranty information</td></tr>
<tr><td rowspan="2"> </td><td>SRT-6</td><td>Opening tool</td><td></td></tr>
<tr><td colspan="3">SRT-6 is used to open phone covers.
Note: The SRT-6 is included in the Nokia Standard Toolkit.</td></tr>
<tr><td rowspan="2">

SS-46
NOKIA Bochum

</td><td>SS-46</td><td>Interface adapter</td><td></td></tr>
<tr><td colspan="3">SS-46 acts as an interface adapter between the flash adapter and FPS-20/FPS-21.</td></tr>
</table>

<table>
<tr><td rowspan="2"></td><td>SS-62</td><td>Generic flash adapter base for BB5</td><td></td></tr>
<tr><td colspan="3">• generic base for flash adapters and couplers
• SS-62 equipped with a clip interlock system
• provides standardised interface towards Control Unit
• provides RF connection using galvanic connector or coupler
• multiplexing between USB and FBUS media, controlled by VUSB</td></tr>
<tr><td rowspan="2"> </td><td>SX-4</td><td>Smart card</td><td></td></tr>
<tr><td colspan="3">SX-4 is a BB5 security device used to protect critical features in tuning and testing.
SX-4 is also needed together with FPS-20/FPS-21 when DCT-4 phones are flashed.</td></tr>
</table>

Cables

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-470. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

<table>
<tr><td rowspan="2">

CA-101
100cm

</td><td>CA-101</td><td>Micro USB cable</td><td></td></tr>
<tr><td colspan="3">The CA-101 is a USB-to-microUSB data cable that allows connections between the PC and the phone.</td></tr>
</table>

CA-31D	USB cable	

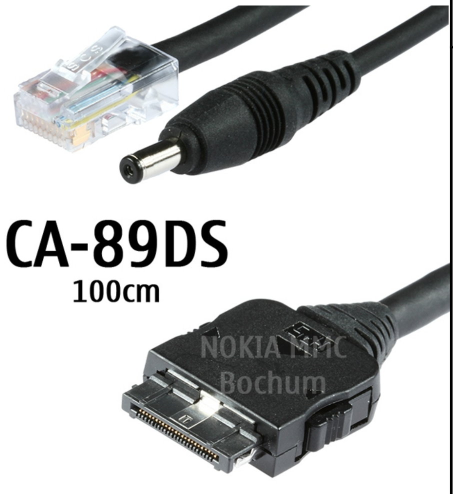
The CA-31D USB cable is used to connect FPS-20/FPS-21 to a PC. It is included in the FPS-20/FPS-21 sales packages.

CA-58RS	RF tuning cable	

Product-specific adapter cable for RF tuning.

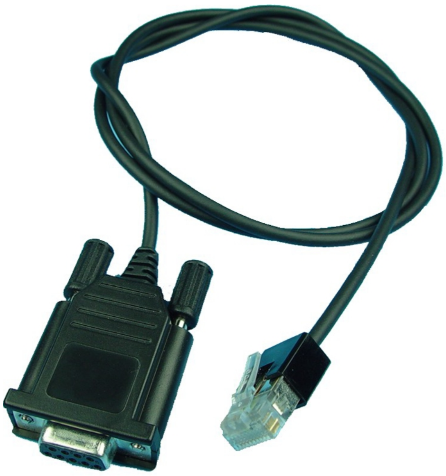
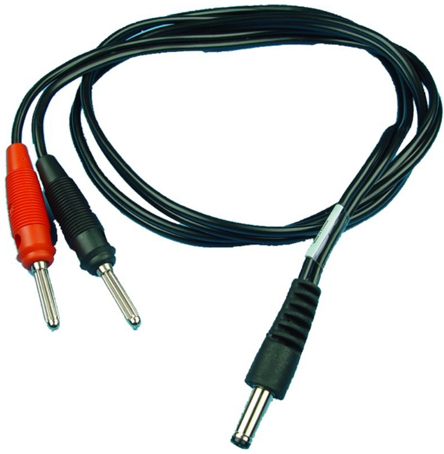
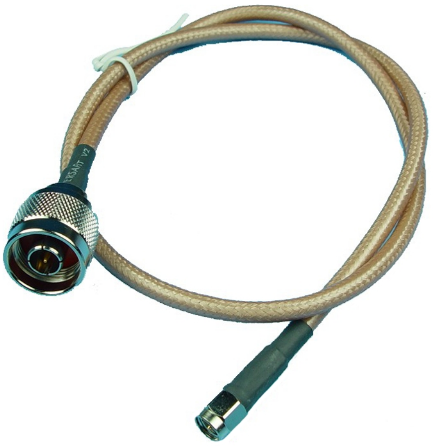
- **Table 5 Attenuation values**

Band	Attenuation Rx/Tx
GSM850/900	0.2...0.3 dB
GSM1800/1900	0.3...0.4 dB
WCDMA/WLAN	0.4...0.6 dB



CA-89DS	Cable	

Provides VBAT and Flashbus connections to mobile device programming adapters.

<table>
<tr><td rowspan="2"></td><td>DAU-9S</td><td>MBUS cable</td><td></td></tr>
<tr><td colspan="3">The MBUS cable DAU-9S has a modular connector and is used, for example, between the PC's serial port and module jigs, flash adapters or docking station adapters.
Note: Docking station adapters valid for DCT4 products.</td></tr>
<tr><td rowspan="2"></td><td>PCS-1</td><td>Power cable</td><td></td></tr>
<tr><td colspan="3">The PCS-1 power cable (DC) is used with a docking station, a module jig or a control unit to supply a controlled voltage.</td></tr>
<tr><td rowspan="2"></td><td>XRS-6</td><td>RF cable</td><td></td></tr>
<tr><td colspan="3">The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment.
SMA to N-Connector approximately 610 mm.
Attenuation for:
• GSM850/900: 0.3+-0.1 dB
• GSM1800/1900: 0.5+-0.1 dB
• WCDMA/WLAN: 0.6+-0.1dB</td></tr>
</table>

Service concepts

POS (Point of Sale) flash concept

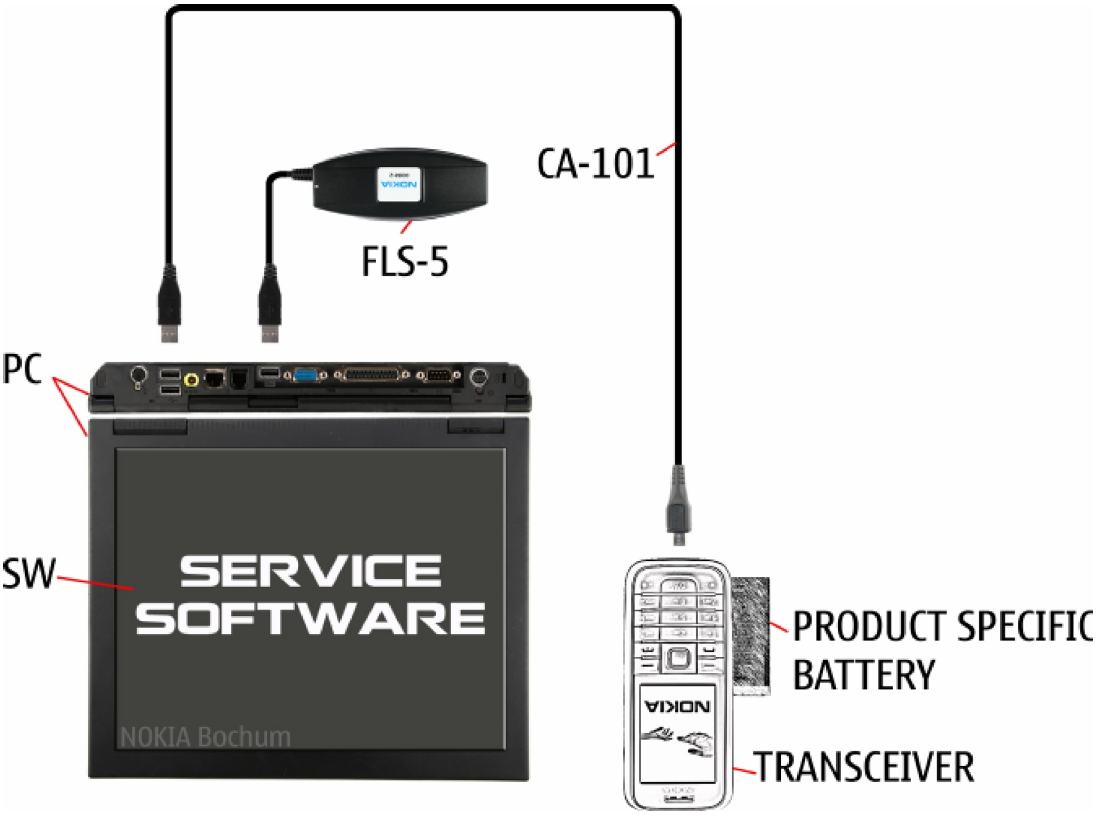

CA-101
FLS-5
PC
SW
SERVICE SOFTWARE
NOKIA Bochum
PRODUCT SPECIFIC BATTERY
TRANSCEIVER

Figure 3 POS flash concept

Type	Description
Product specific tools	
BL-6Q	Battery
Other tools	
FLS-5	POS flash dongle
	PC with Phoenix service software
Cables	
CA-101	Micro USB cable

Flash concept with FPS-21

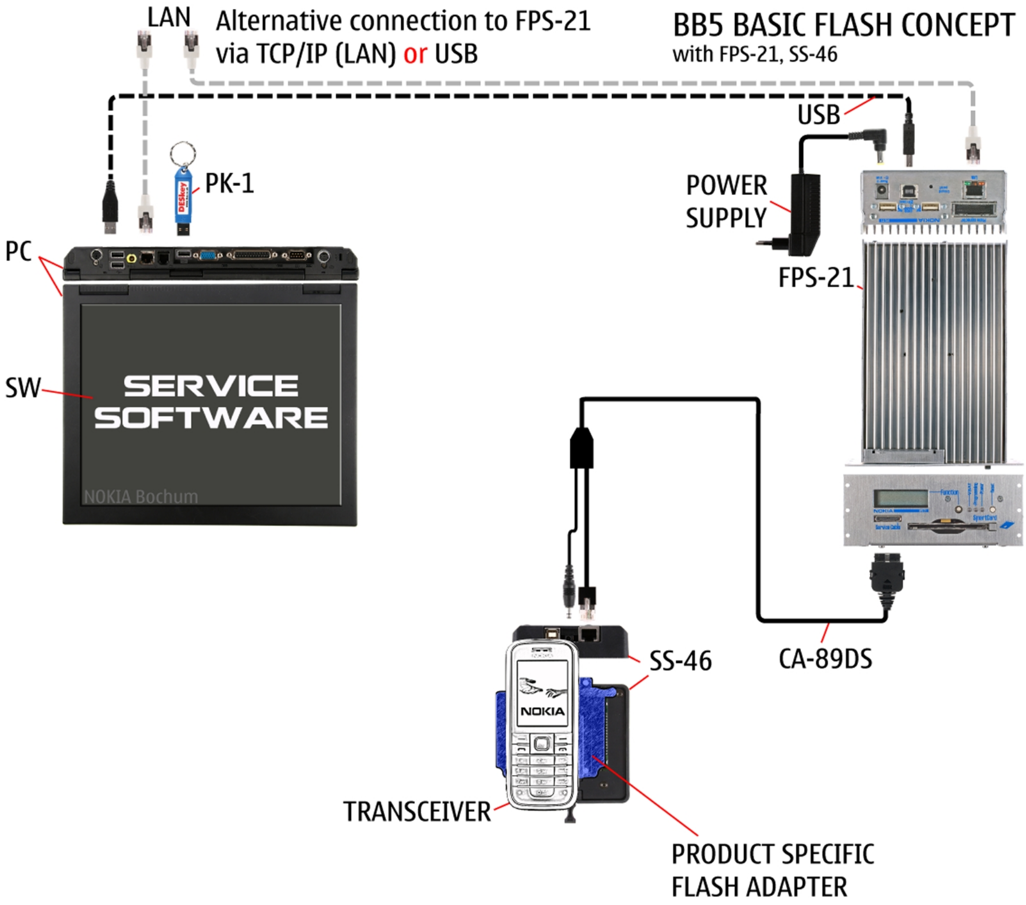

LAN
Alternative connection to FPS-21
via TCP/IP (LAN) or USB
BB5 BASIC FLASH CONCEPT
with FPS-21, SS-46
USB
PK-1
POWER
SUPPLY
PC
FPS-21
SW
SERVICE
SOFTWARE
NOKIA Bochum
SS-46
CA-89DS
TRANSCEIVER
PRODUCT SPECIFIC
FLASH ADAPTER

Figure 4 Basic flash concept with FPS-21

Type	Description
Product specific devices	
FS-98	Flash adapter
Other devices	
FPS-21	Flash prommer box
AC-35	Power supply
PK-1/PKD-1	SW security device
SS-46	Interface adapter
	PC with Phoenix service software
Cables	
CA-89DS	Service cable
	USB cable

CU-4 flash concept with FPS-21

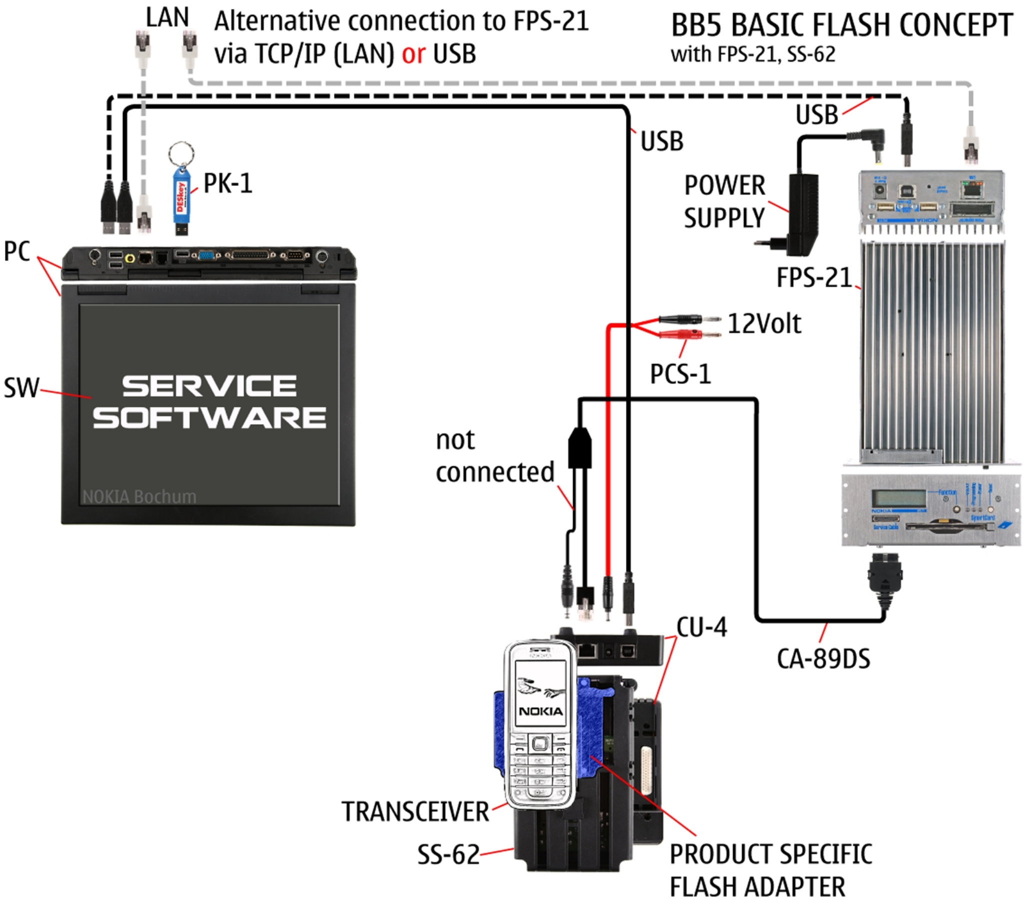

LAN
Alternative connection to FPS-21
via TCP/IP (LAN) or USB
BB5 BASIC FLASH CONCEPT
with FPS-21, SS-62
USB
USB
PK-1
POWER
SUPPLY
PC
FPS-21
12Volt
PCS-1
SW
SERVICE
SOFTWARE
NOKIA Bochum
not
connected
CU-4
CA-89DS
TRANSCEIVER
SS-62
PRODUCT SPECIFIC
FLASH ADAPTER

Figure 5 CU-4 flash concept with FPS-21

Type	Description
Product specific devices	
FS-98	Flash adapter
Other devices	
CU-4	Control unit
FPS-21	Flash prommer box
AC-35	Power supply
PK-1/PKD-1	SW security device
SS-62	Flash adapter base
SX-4	Smart card (for DCT-4 generation mobile device programming)
	PC with Phoenix service software
Cables	
PCS-1	Power cable
CA-89DS	Service cable
	Standard USB cable

Type	Description
	USB cable

Module jig service concept

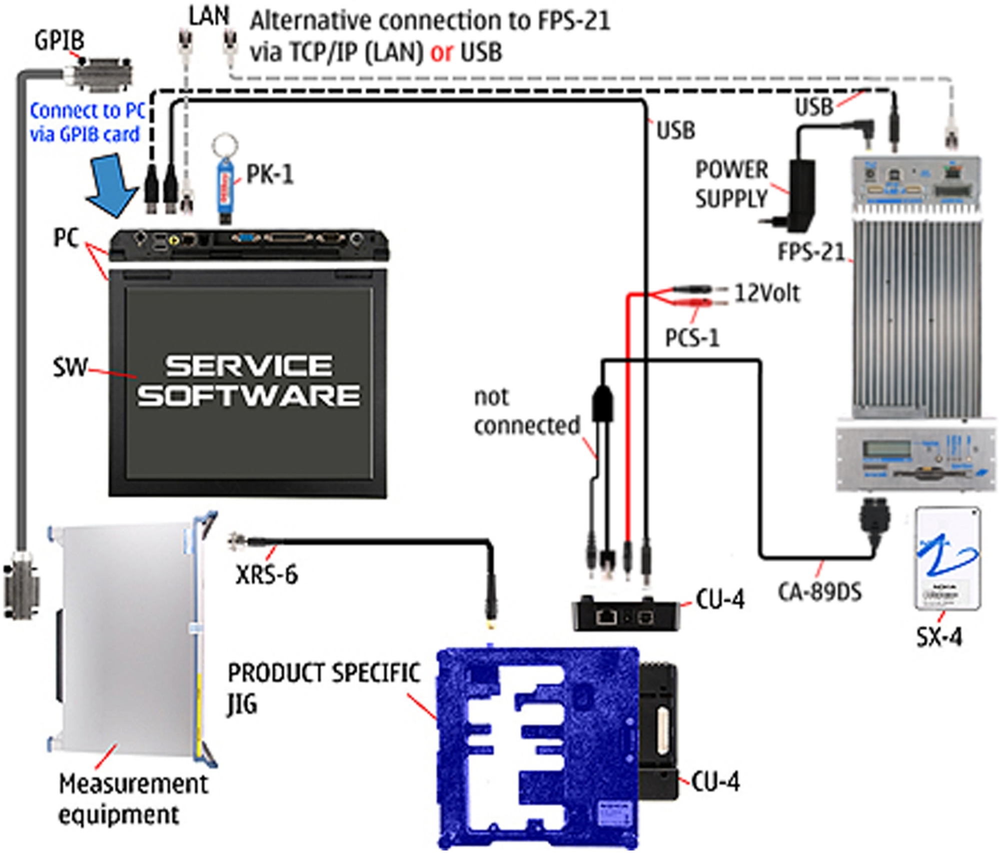

GPIB
LAN
Alternative connection to FPS-21
via TCP/IP (LAN) or USB
Connect to PC
via GPIB card
PK-1
USB
USB
POWER
SUPPLY
PC
FPS-21
12Volt
PCS-1
SW
SERVICE
SOFTWARE
not
connected
XRS-6
CU-4
CA-89DS
SX-4
PRODUCT SPECIFIC
JIG
Measurement
equipment
CU-4

Figure 6 Module jig service concept

Type	Description
Phone specific devices	
MJ-204	Module jig
Other devices	
CU-4	Control unit
FPS-21	Flash prommer box
PK-1/PKD-1	SW security device
SX-4	Smart card
	PC with VPOS and Phoenix service software
	Measurement equipment
Cables	
CA-89DS	Service cable
PCS-1	DC power cable

Type	Description
XRS-6	RF cable
	USB cable
	GPIB control cable

RF testing concept with RF coupler

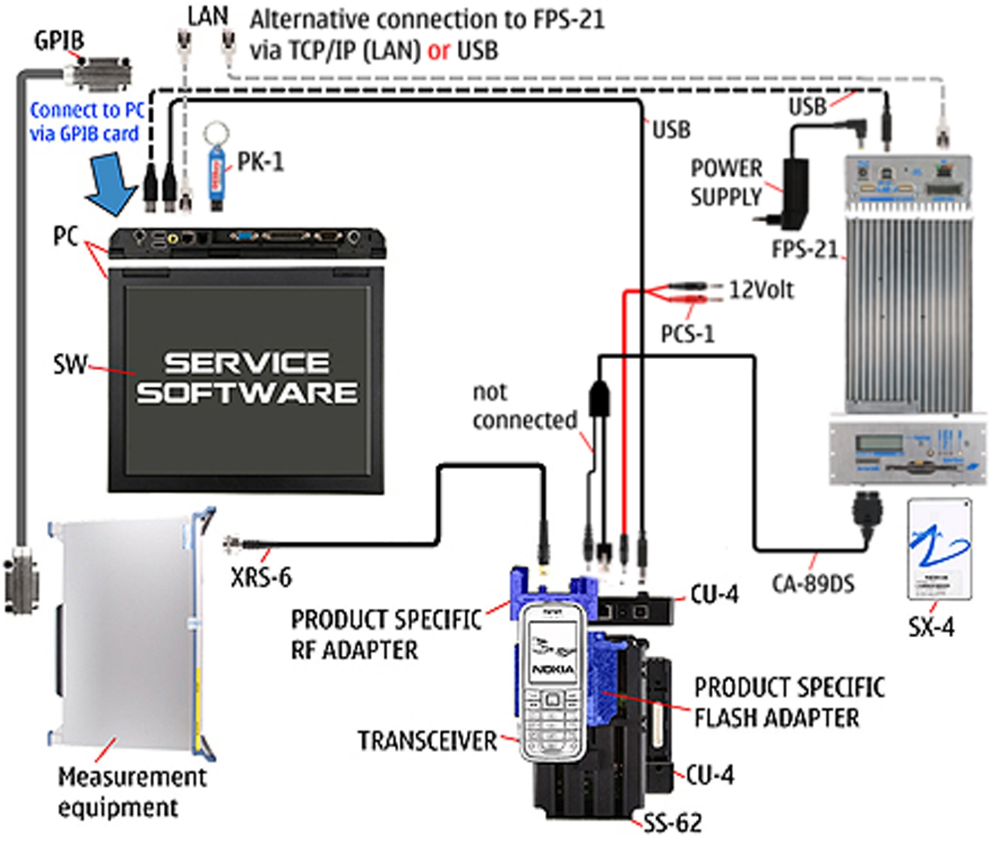

LAN
Alternative connection to FPS-21 via TCP/IP (LAN) or USB
GPIB
Connect to PC via GPIB card
PK-1
USB
USB
POWER SUPPLY
PC
FPS-21
12Volt
PCS-1
SW
SERVICE SOFTWARE
not connected
XRS-6
CU-4
CA-89DS
SX-4
PRODUCT SPECIFIC RF ADAPTER
PRODUCT SPECIFIC FLASH ADAPTER
TRANSCEIVER
CU-4
SS-62
Measurement equipment

Figure 7 RF testing concept with RF coupler

Type	Description
Product specific devices	
FS-98	Flash adapter
SA-106	RF coupler
Other devices	
CU-4	Control unit
SX-4	Smart card
FPS-21	Flash prommer box
PK-1/PKD-1	SW security device
SS-62	Flash adapter base
	Measurement equipment
	PC with Phoenix service software

Type	Description
Cables	
CA-89DS	Service cable
PCS-1	Power cable
XRS-6	RF cable
	GPIB control cable
	USB cable

Service concept for RF testing and RF/BB tuning

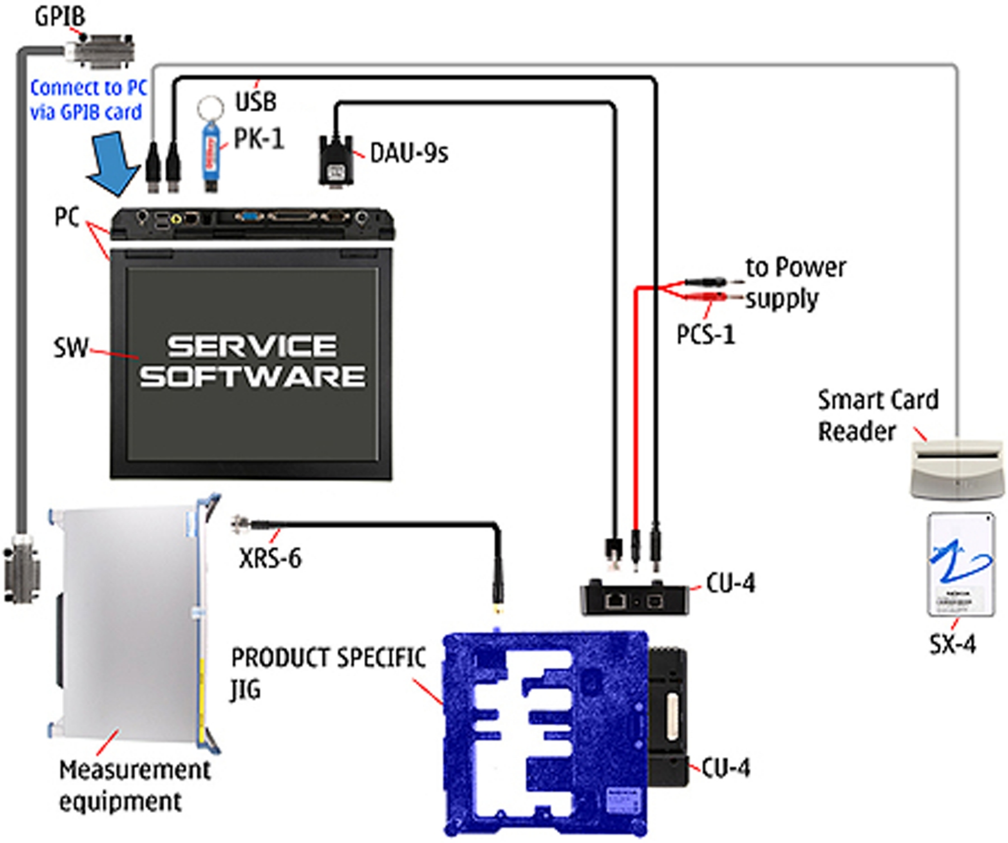

GPIB
Connect to PC via GPIB card
USB
PK-1
DAU-9s
PC
SW
SERVICE SOFTWARE
to Power supply
PCS-1
Smart Card Reader
XRS-6
CU-4
SX-4
PRODUCT SPECIFIC JIG
Measurement equipment
CU-4

Figure 8 Service concept for RF testing and RF/BB tuning

Type	Description
Product specific devices	
MJ-204	Module jig
Other devices	
CU-4	Control unit
PK-1/PKD-1	SW security device
SX-4	Smart card
	Measurement equipment

Type	Description
	Smart card reader
	PC with Phoenix service software
Cables	
DAU-9S	MBUS cable
PCS-1	DC power cable
XRS-6	RF cable
	GPIB control cable
	USB cable

GPS testing concept with GPS RF coupler

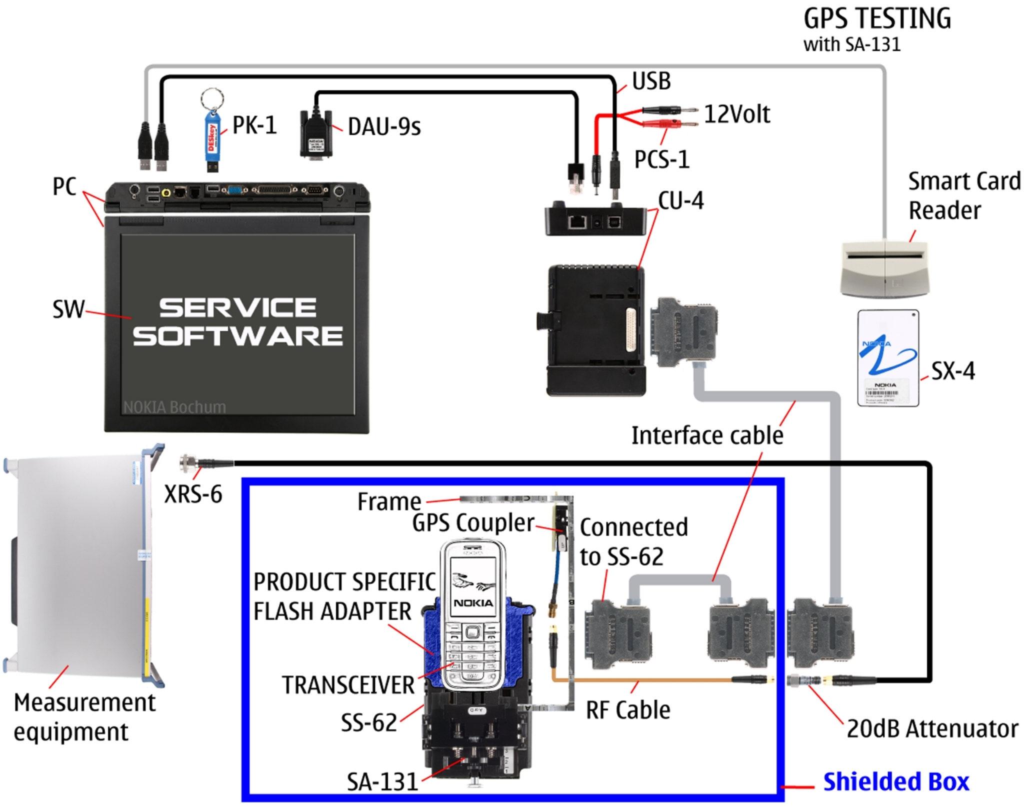

GPS TESTING
with SA-131
USB
PK-1
DAU-9s
12Volt
PCS-1
PC
CU-4
Smart Card
Reader
SW
SERVICE
SOFTWARE
NOKIA Bochum
SX-4
Interface cable
XRS-6
Frame
GPS Coupler
Connected
to SS-62
PRODUCT SPECIFIC
FLASH ADAPTER
TRANSCEIVER
SS-62
RF Cable
20dB Attenuator
Measurement
equipment
SA-131
Shielded Box

Figure 9 RF testing concept with RF coupler

Type	Description
Product specific devices	
FS-98	Flash adapter
SA-131	GPS RF coupler
Other devices	
CU-4	Control unit
SX-4	Smart card

Type	Description
JXS-1	RF shield box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
	Smart card reader
	Measurement equipment
	PC with Phoenix service software
Cables	
CA-58RS	RF service cable (product-specific adapter cable)
PCS-1	Power cable
DAU-9S	MBUS cable
XRS-6	RF cable
	20dB attenuator
	Interface cable
	USB cable

Bluetooth testing concept with SB-6

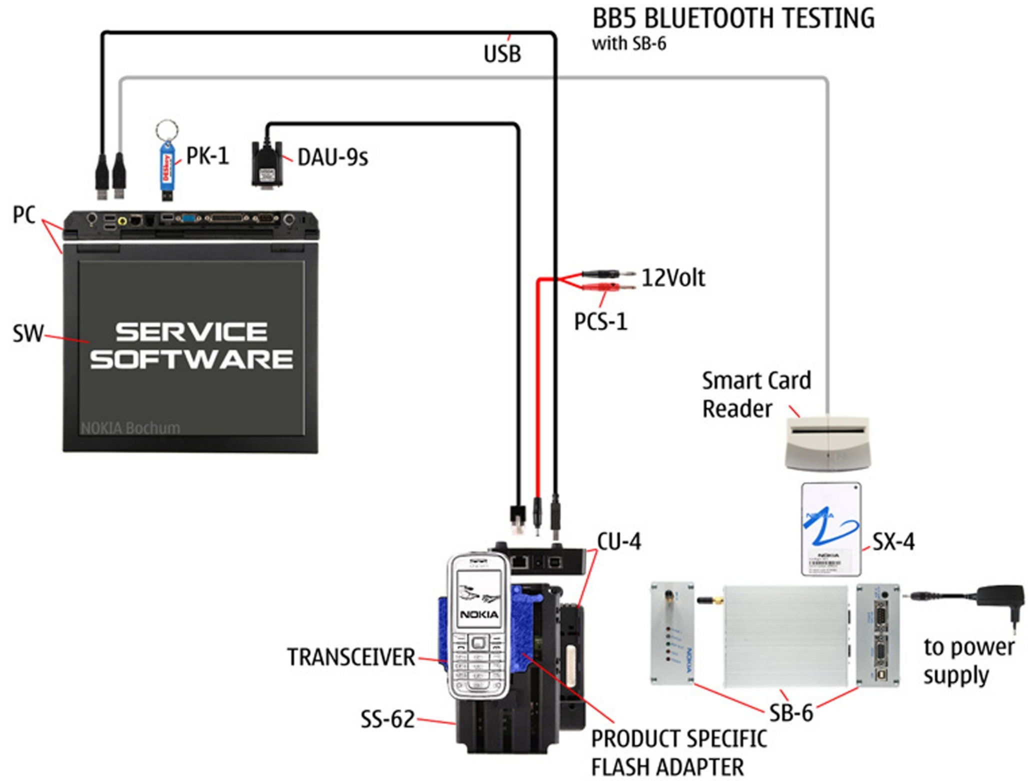

BB5 BLUETOOTH TESTING
with SB-6
USB
PK-1
DAU-9s
PC
SW
SERVICE SOFTWARE
NOKIA Bochum
12Volt
PCS-1
Smart Card Reader
CU-4
SX-4
to power supply
TRANSCEIVER
SS-62
SB-6
PRODUCT SPECIFIC FLASH ADAPTER

Figure 10 Service concept for RF testing and RF/BB tuning

Type	Description
Product specific devices	

Type	Description
FS-98	Flash adapter
Other devices	
CU-4	Control unit
SS-62	Flash adapter base
PK-1	SW security device
SX-4	Smart card
SB-6	Bluetooth test and interface box
	Smart card reader
	PC with Phoenix service software
Cables	
DAU-9S	MBUS cable
PCS-1	DC power cable
	USB cable

3 — BB Troubleshooting and Manual Tuning Guide

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  Dead or jammed device troubleshooting 3–7
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IHF troubleshooting 3–56
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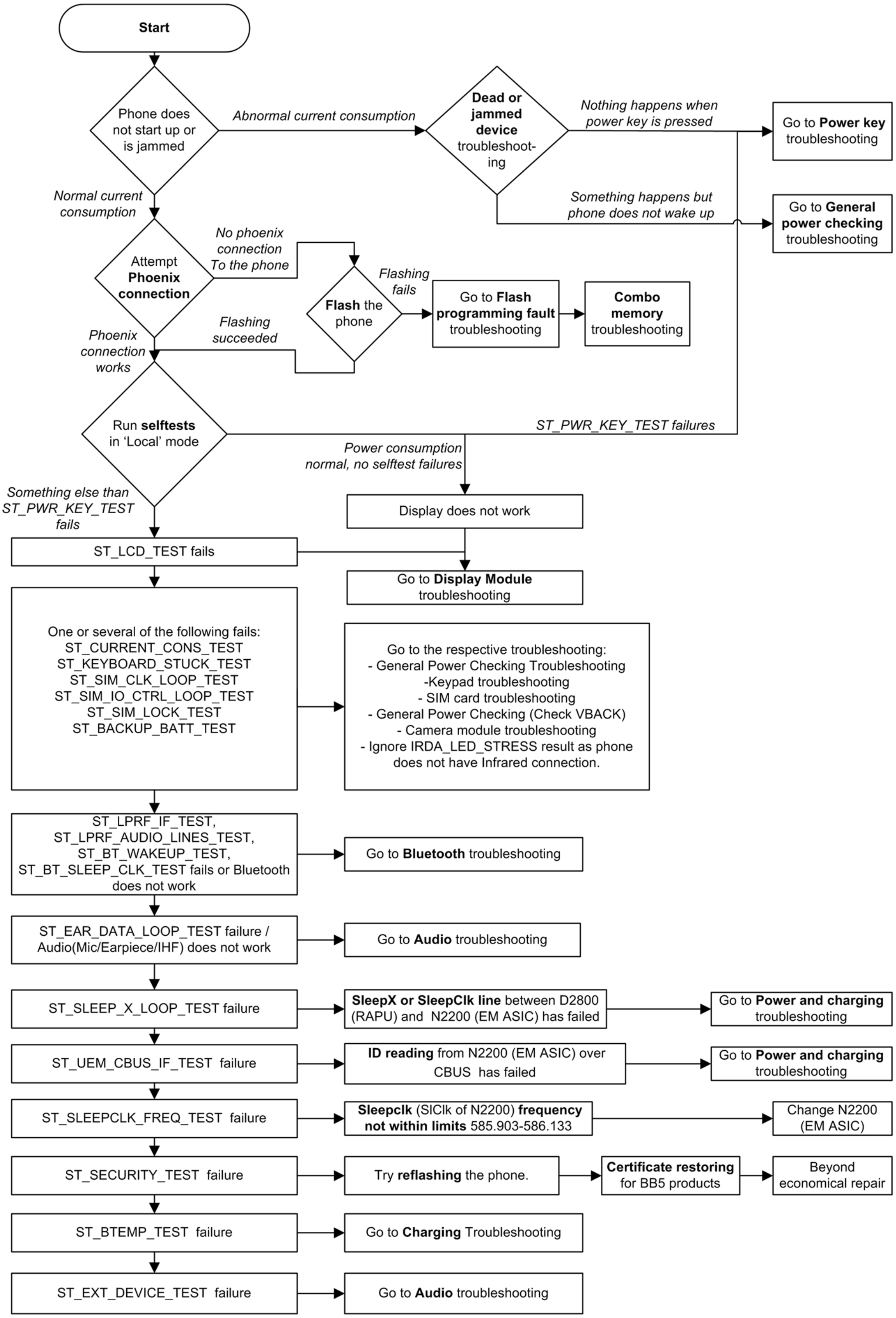
Baseband self tests in Phoenix

Context

Always start the troubleshooting procedure by running the Phoenix self tests. If a test fails, please follow the diagram below.

If the phone is dead and you cannot perform the self tests, go to *Dead or jammed device troubleshooting.*

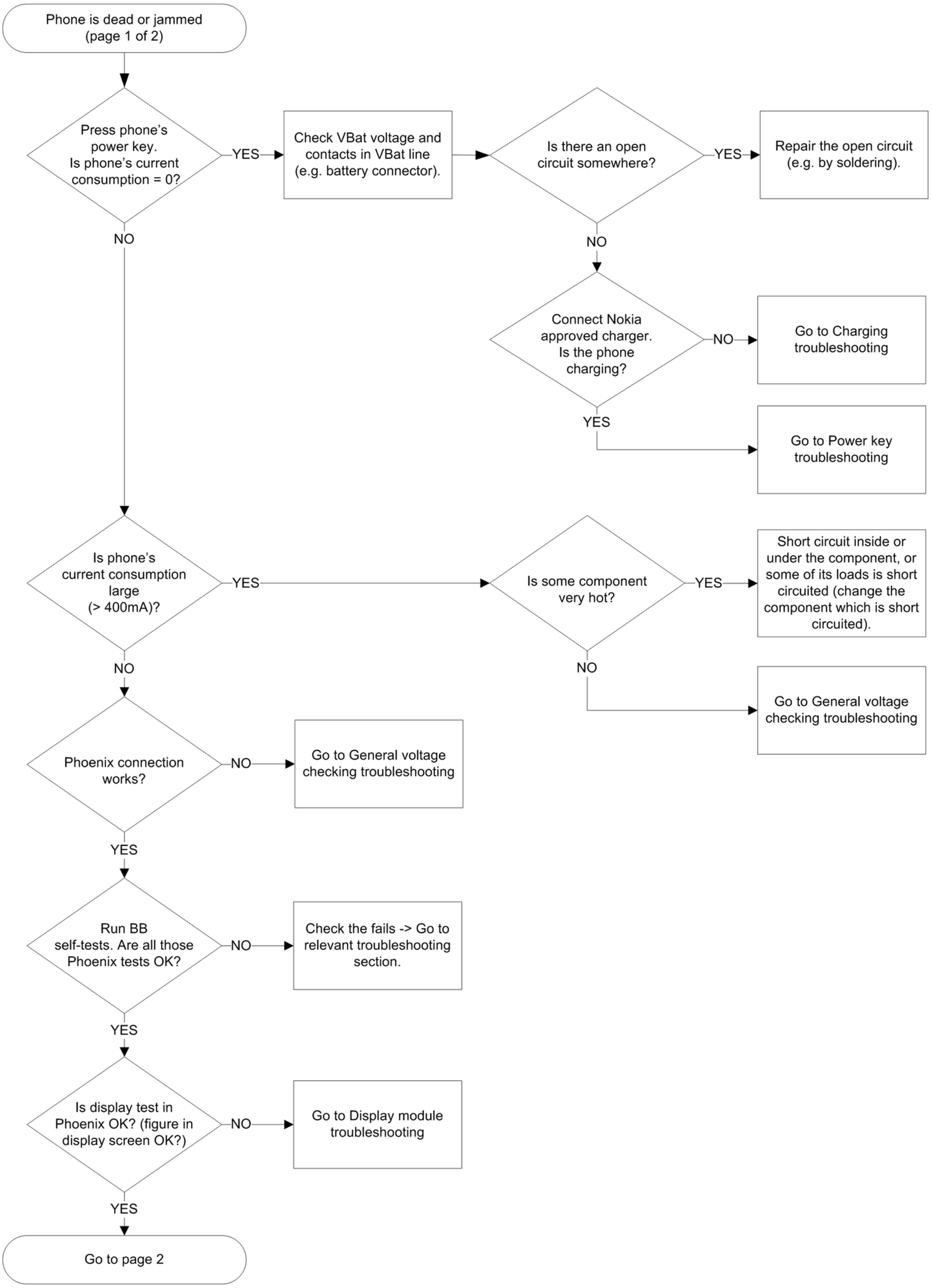
Troubleshooting flow


Start
Phone does not start up or is jammed
Abnormal current consumption
Dead or jammed device troubleshoot-ing
Nothing happens when power key is pressed
Go to Power key troubleshooting
Something happens but phone does not wake up
Go to General power checking troubleshooting
Normal current consumption
Attempt Phoenix connection
No phoenix connection To the phone
Flash the phone
Flashing fails
Go to Flash programming fault troubleshooting
Combo memory troubleshooting
Flashing succeeded
Phoenix connection works
Run selftests in 'Local' mode
ST_PWR_KEY_TEST failures
Power consumption normal, no selftest failures
Display does not work
Something else than ST_PWR_KEY_TEST fails
ST_LCD_TEST fails
Go to Display Module troubleshooting
One or several of the following fails:
ST_CURRENT_CONS_TEST
ST_KEYBOARD_STUCK_TEST
ST_SIM_CLK_LOOP_TEST
ST_SIM_IO_CTRL_LOOP_TEST
ST_SIM_LOCK_TEST
ST_BACKUP_BATT_TEST
Go to the respective troubleshooting:
- General Power Checking Troubleshooting
-Keypad troubleshooting
- SIM card troubleshooting
- General Power Checking (Check VBACK)
- Camera module troubleshooting
- Ignore IRDA_LED_STRESS result as phone does not have Infrared connection.
ST_LPRF_IF_TEST, ST_LPRF_AUDIO_LINES_TEST, ST_BT_WAKEUP_TEST, ST_BT_SLEEP_CLK_TEST fails or Bluetooth does not work
Go to Bluetooth troubleshooting
ST_EAR_DATA_LOOP_TEST failure / Audio(Mic/Earpiece/IHF) does not work
Go to Audio troubleshooting
ST_SLEEP_X_LOOP_TEST failure
SleepX or SleepClk line between D2800 (RAPU) and N2200 (EM ASIC) has failed
Go to Power and charging troubleshooting
ST_UEM_CBUS_IF_TEST failure
ID reading from N2200 (EM ASIC) over CBUS has failed
Go to Power and charging troubleshooting
ST_SLEEPCLK_FREQ_TEST failure
Sleepclk (SlClk of N2200) frequency not within limits 585.903-586.133
Change N2200 (EM ASIC)
ST_SECURITY_TEST failure
Try reflashing the phone.
Certificate restoring for BB5 products
Beyond economical repair
ST_BTEMP_TEST failure
Go to Charging Troubleshooting
ST_EXT_DEVICE_TEST failure
Go to Audio troubleshooting

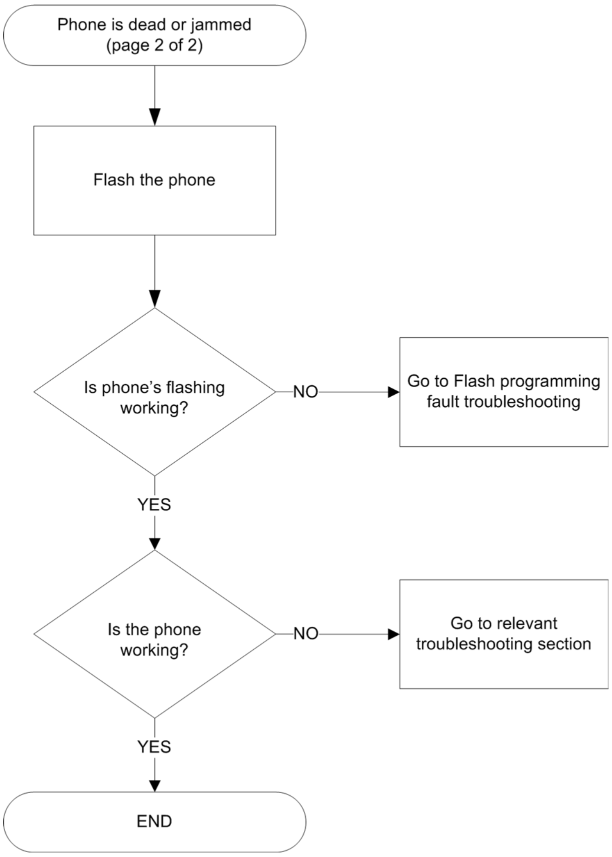
Power and charging troubleshooting

Dead or jammed device troubleshooting

Troubleshooting flow - Page 1 of 2

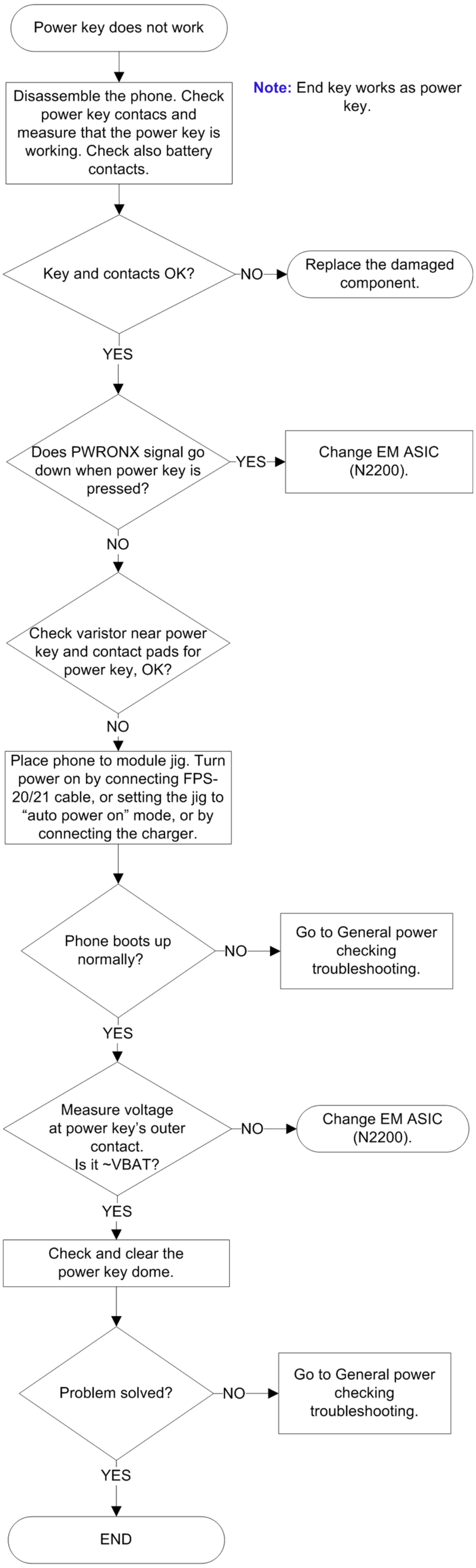

Phone is dead or jammed (page 1 of 2)
Press phone's power key. Is phone's current consumption = 0?
YES
Check VBat voltage and contacts in VBat line (e.g. battery connector).
Is there an open circuit somewhere?
YES
Repair the open circuit (e.g. by soldering).
NO
Connect Nokia approved charger. Is the phone charging?
NO
Go to Charging troubleshooting
YES
Go to Power key troubleshooting
NO
Is phone's current consumption large (> 400mA)?
YES
Is some component very hot?
YES
Short circuit inside or under the component, or some of its loads is short circuited (change the component which is short circuited).
NO
Go to General voltage checking troubleshooting
NO
Phoenix connection works?
NO
Go to General voltage checking troubleshooting
YES
Run BB self-tests. Are all those Phoenix tests OK?
NO
Check the fails -> Go to relevant troubleshooting section.
YES
Is display test in Phoenix OK? (figure in display screen OK?)
NO
Go to Display module troubleshooting
YES
Go to page 2

Troubleshooting flow - Page 2 of 2


Phone is dead or jammed (page 2 of 2)
Flash the phone
Is phone's flashing working?
NO
Go to Flash programming fault troubleshooting
YES
Is the phone working?
NO
Go to relevant troubleshooting section
YES
END

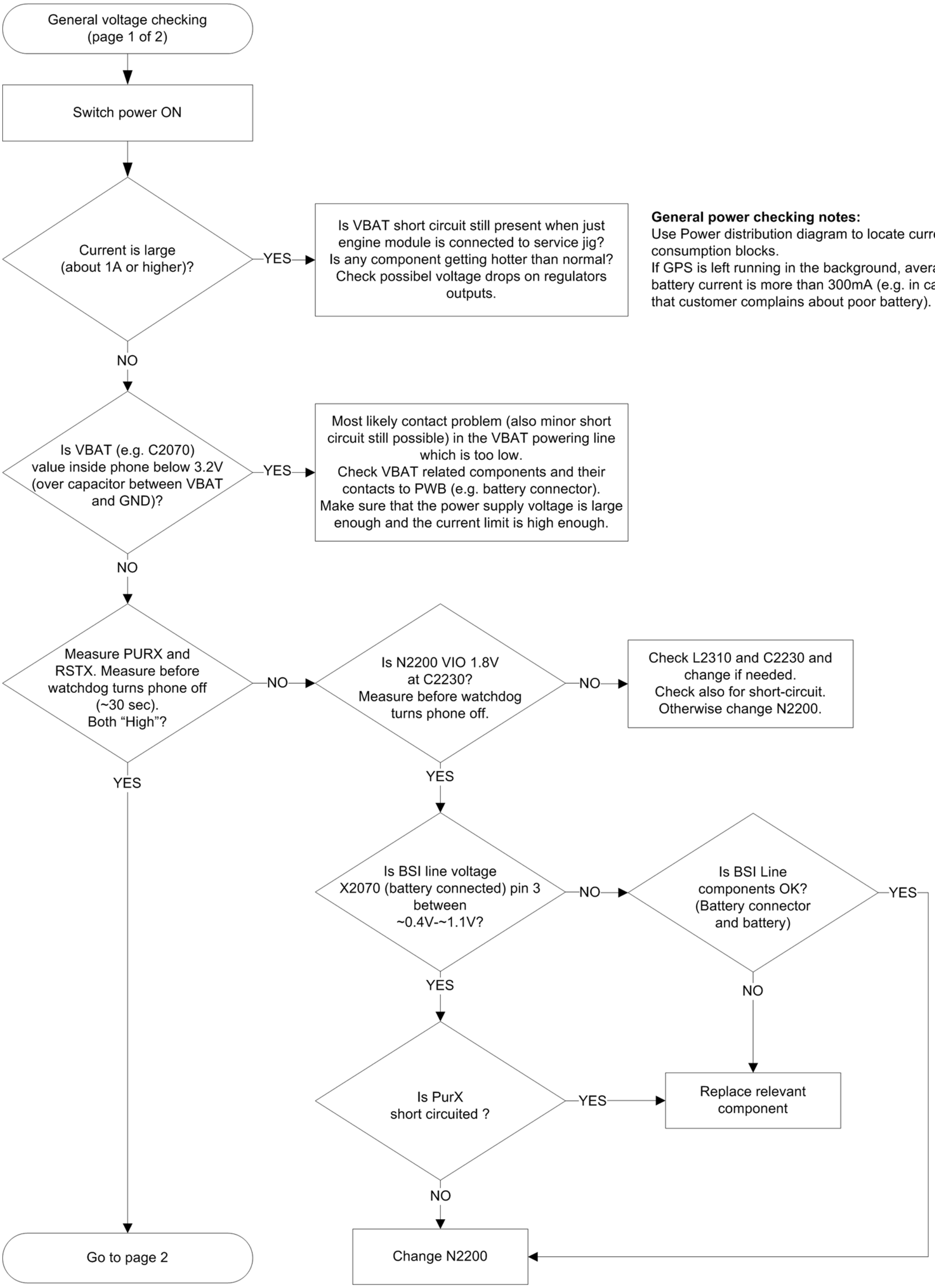
Power key troubleshooting

Troubleshooting flow


Power key does not work
Disassemble the phone. Check power key contacs and measure that the power key is working. Check also battery contacts.
Note: End key works as power key.
Key and contacts OK?
NO
Replace the damaged component.
YES
Does PWRONX signal go down when power key is pressed?
YES
Change EM ASIC (N2200).
NO
Check varistor near power key and contact pads for power key, OK?
NO
Place phone to module jig. Turn power on by connecting FPS-20/21 cable, or setting the jig to "auto power on" mode, or by connecting the charger.
Phone boots up normally?
NO
Go to General power checking troubleshooting.
YES
Measure voltage at power key's outer contact. Is it ~VBAT?
NO
Change EM ASIC (N2200).
YES
Check and clear the power key dome.
Problem solved?
NO
Go to General power checking troubleshooting.
YES
END

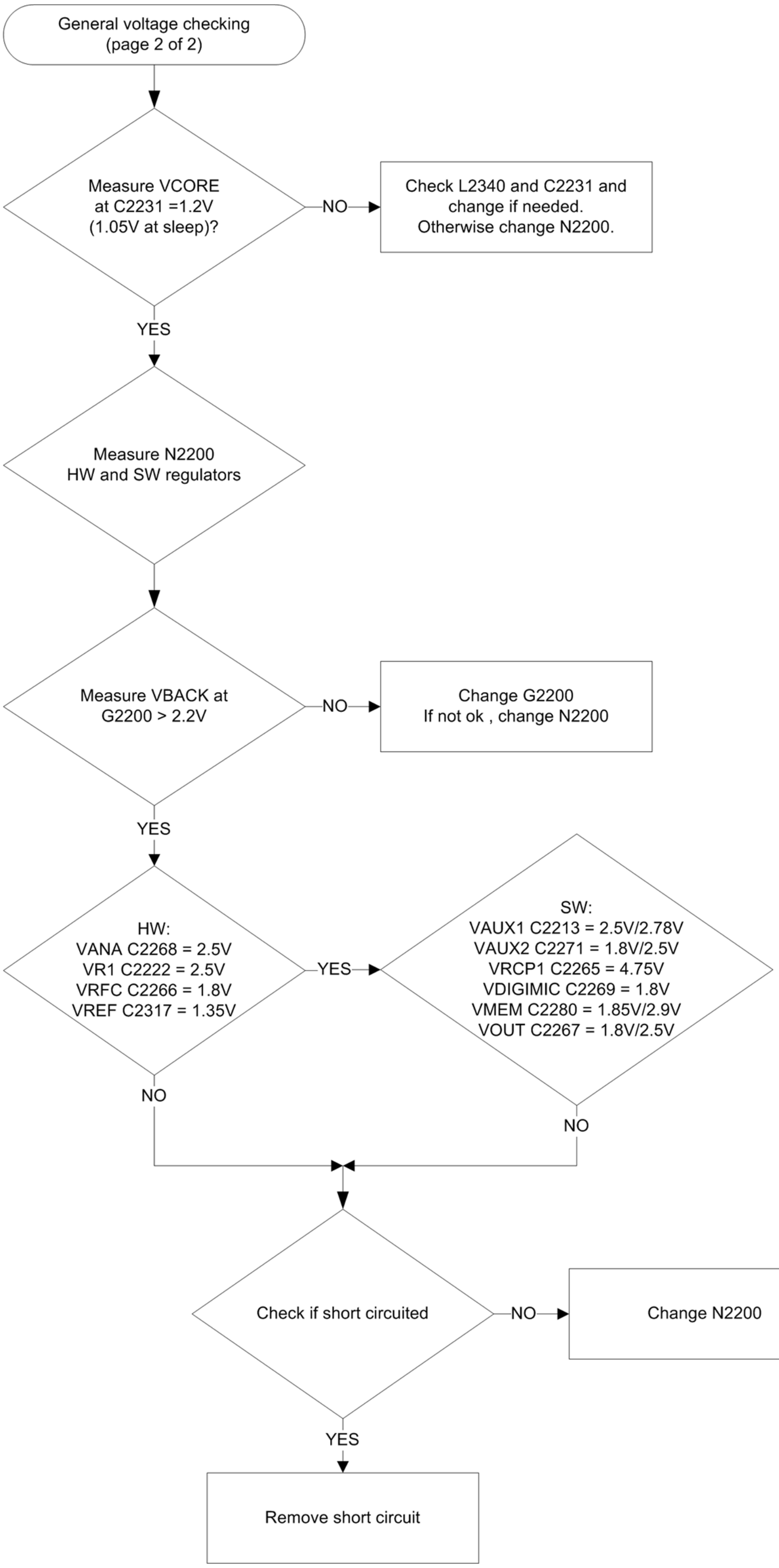
General voltage checking troubleshooting

Troubleshooting flow - Page 1 of 2


General voltage checking (page 1 of 2)
Switch power ON
Current is large (about 1A or higher)?
YES
Is VBAT short circuit still present when just engine module is connected to service jig? Is any component getting hotter than normal? Check possibel voltage drops on regulators outputs.
NO
Is VBAT (e.g. C2070) value inside phone below 3.2V (over capacitor between VBAT and GND)?
YES
Most likely contact problem (also minor short circuit still possible) in the VBAT powering line which is too low. Check VBAT related components and their contacts to PWB (e.g. battery connector). Make sure that the power supply voltage is large enough and the current limit is high enough.
NO
Measure PURX and RSTX. Measure before watchdog turns phone off (~30 sec). Both “High”?
NO
Is N2200 VIO 1.8V at C2230? Measure before watchdog turns phone off.
NO
Check L2310 and C2230 and change if needed. Check also for short-circuit. Otherwise change N2200.
YES
YES
Is BSI line voltage X2070 (battery connected) pin 3 between ~0.4V-~1.1V?
NO
Is BSI Line components OK? (Battery connector and battery)
YES
NO
YES
Is PurX short circuited ?
YES
Replace relevant component
NO
Go to page 2
Change N2200

General power checking notes:
Use Power distribution diagram to locate current consumption blocks.
If GPS is left running in the background, average battery current is more than 300mA (e.g. in case that customer complains about poor battery).

Troubleshooting flow - Page 2 of 2


General voltage checking
(page 2 of 2)
Measure VCORE
at C2231 =1.2V
(1.05V at sleep)?
NO
Check L2340 and C2231 and
change if needed.
Otherwise change N2200.
YES
Measure N2200
HW and SW regulators
Measure VBACK at
G2200 > 2.2V
NO
Change G2200
If not ok , change N2200
YES
HW:
VANA C2268 = 2.5V
VR1 C2222 = 2.5V
VRFC C2266 = 1.8V
VREF C2317 = 1.35V
YES
SW:
VAUX1 C2213 = 2.5V/2.78V
VAUX2 C2271 = 1.8V/2.5V
VRCP1 C2265 = 4.75V
VDIGIMIC C2269 = 1.8V
VMEM C2280 = 1.85V/2.9V
VOUT C2267 = 1.8V/2.5V
NO
NO
Check if short circuited
NO
Change N2200
YES
Remove short circuit

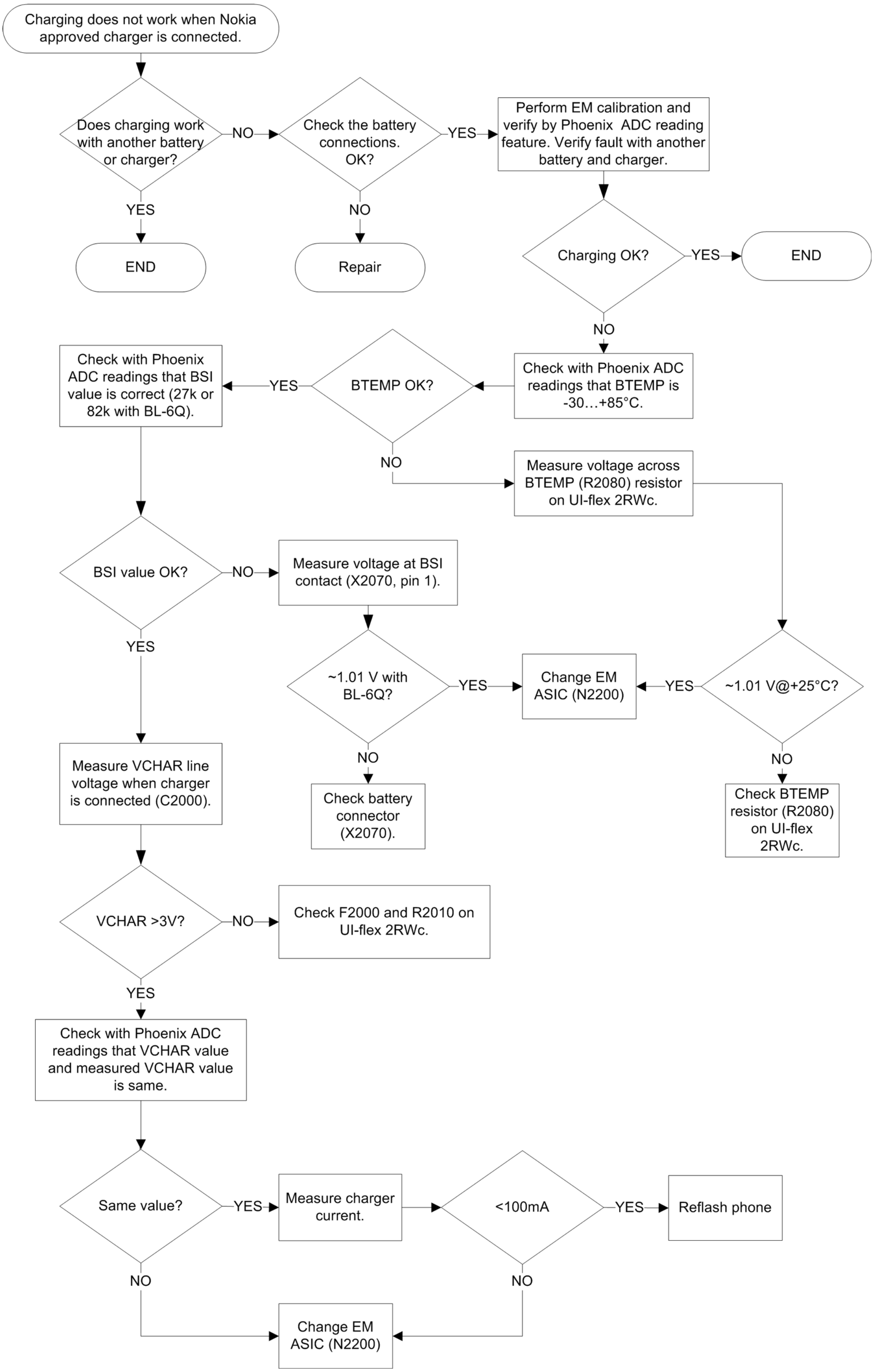
General power checking

Check the following voltages:

Signal Rename	Regulator	Sleep	Idle	Nominal voltage	Main user	Notes
VIO	Pearl/Gazoo	ON	ON	1.8	Memory, I/Os, Display	
VBACK	Pearl/Gazoo	ON	ON	2.5	Back-up battery	
VSIM1	Pearl/Gazoo	ON	ON	1.8/3.0	SIM card	
VAUX1	Pearl/Gazoo	ON	ON	2.8	TV-OUT, 3DFS, MR, Display	
VAUX2	Pearl/Gazoo	OFF	OFF	2.5	ALS	
VANA	Pearl/Gazoo	ON	ON	2.5	Audio	
VR1	Pearl/Gazoo	OFF	ON	2.5	Crystal oscillators	
VRFC	Pearl/Gazoo	OFF	ON	1.8	RAPU converters	
VRCP1	Pearl/Gazoo			4.75	To RF parts	
VREF	Pearl/Gazoo	ON	ON	1.25	RF reference	
VCORE	Pearl/Gazoo	ON	ON	1.2	RAPU digital	Can change due to RAPU version & SW
VOUT	Pearl/Gazoo	OFF	OFF	2.5	Video switch	
VCAM_2V8	N1421	OFF	OFF	2.8	Camera	Disabled in sleep
VCAM_1V8	N1420	OFF	OFF	1.800	Camera	Disabled in sleep
VMEM	Pearl/Gazoo	OFF	OFF	2.9	microSD	Disabled in sleep

Charging troubleshooting

Troubleshooting flow


Charging does not work when Nokia approved charger is connected.
Does charging work with another battery or charger?
NO
Check the battery connections. OK?
YES
Perform EM calibration and verify by Phoenix ADC reading feature. Verify fault with another battery and charger.
YES
END
NO
Repair
Charging OK?
YES
END
NO
Check with Phoenix ADC readings that BTEMP is -30…+85°C.
BTEMP OK?
YES
Check with Phoenix ADC readings that BSI value is correct (27k or 82k with BL-6Q).
NO
Measure voltage across BTEMP (R2080) resistor on UI-flex 2RWc.
BSI value OK?
NO
Measure voltage at BSI contact (X2070, pin 1).
YES
~1.01 V with BL-6Q?
YES
Change EM ASIC (N2200)
YES
~1.01 V@+25°C?
NO
Check battery connector (X2070).
NO
Check BTEMP resistor (R2080) on UI-flex 2RWc.
Measure VCHAR line voltage when charger is connected (C2000).
VCHAR >3V?
NO
Check F2000 and R2010 on UI-flex 2RWc.
YES
Check with Phoenix ADC readings that VCHAR value and measured VCHAR value is same.
Same value?
YES
Measure charger current.
<100mA
YES
Reflash phone
NO
NO
Change EM ASIC (N2200)

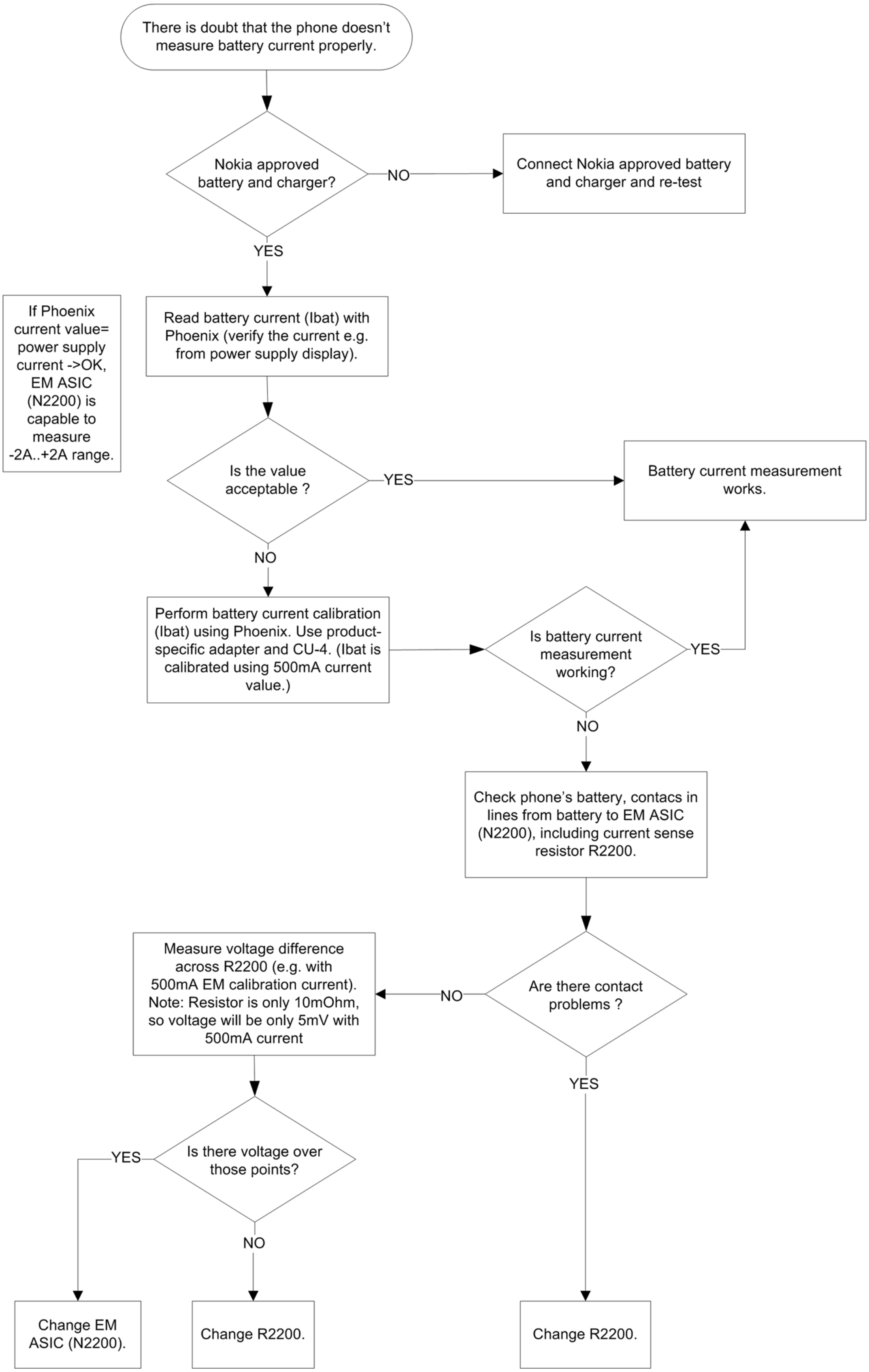
USB charging troubleshooting

Context

For instructions regarding USB charging troubleshooting, see section USB charging troubleshooting (page 3–25).

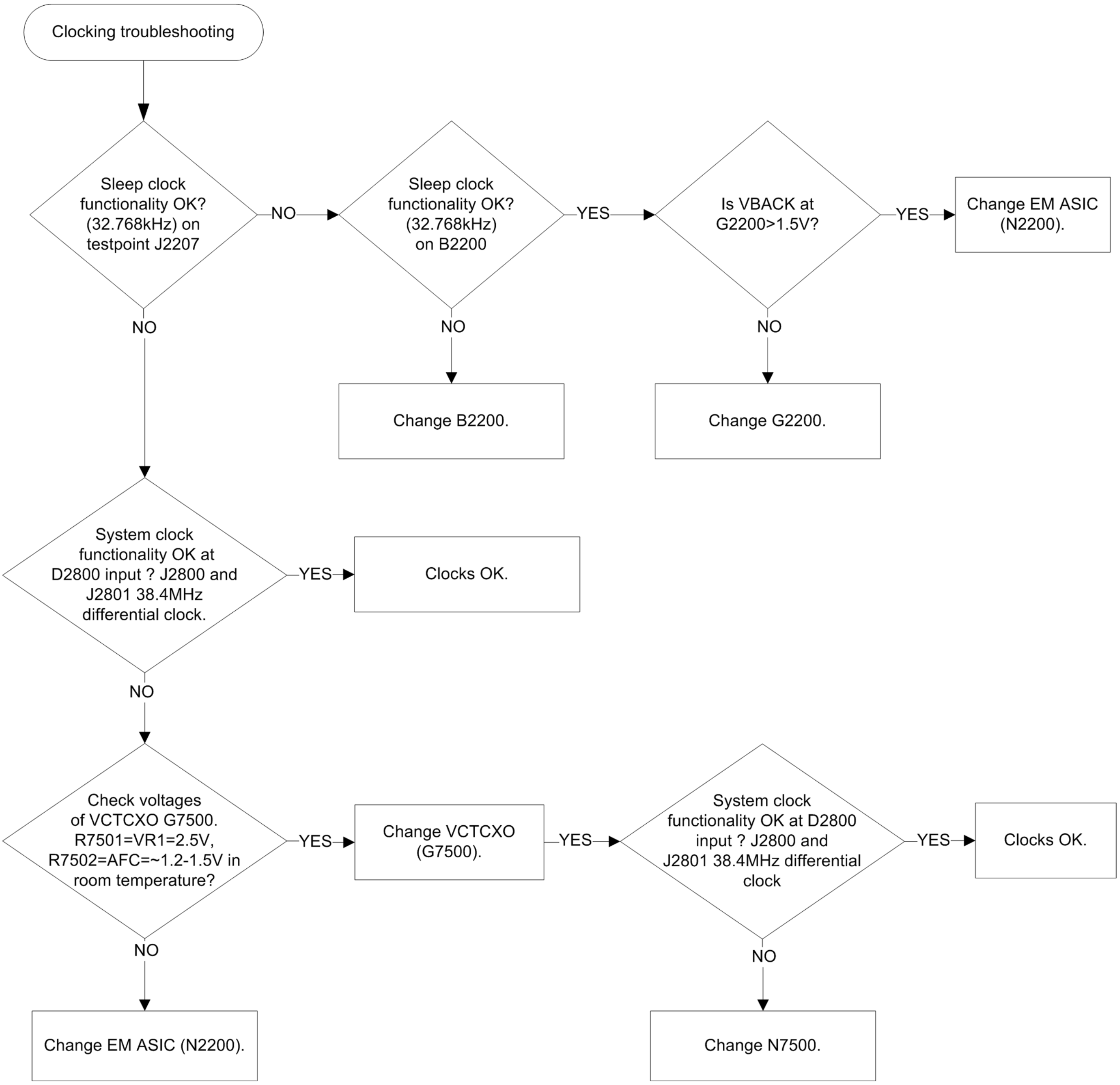
Battery current measuring fault troubleshooting

Troubleshooting flow


There is doubt that the phone doesn't measure battery current properly.
Nokia approved battery and charger?
NO
Connect Nokia approved battery and charger and re-test
YES
If Phoenix current value= power supply current ->OK, EM ASIC (N2200) is capable to measure -2A..+2A range.
Read battery current (Ibat) with Phoenix (verify the current e.g. from power supply display).
Is the value acceptable ?
YES
Battery current measurement works.
NO
Perform battery current calibration (Ibat) using Phoenix. Use product-specific adapter and CU-4. (Ibat is calibrated using 500mA current value.)
Is battery current measurement working?
YES
NO
Check phone's battery, contacs in lines from battery to EM ASIC (N2200), including current sense resistor R2200.
Are there contact problems ?
NO
Measure voltage difference across R2200 (e.g. with 500mA EM calibration current). Note: Resistor is only 10mOhm, so voltage will be only 5mV with 500mA current
YES
Is there voltage over those points?
YES
NO
Change EM ASIC (N2200).
Change R2200.
Change R2200.

Clocking troubleshooting

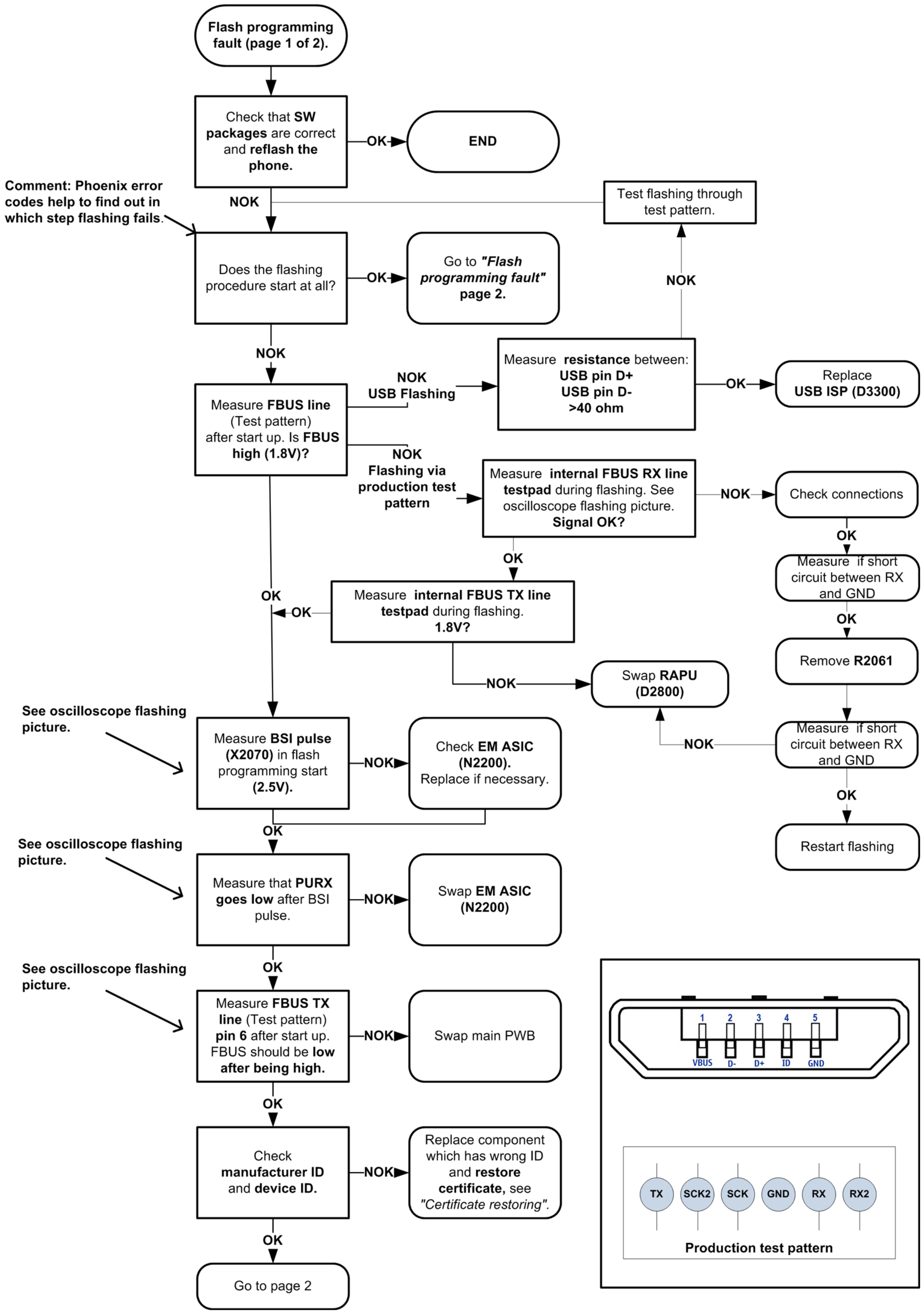
Troubleshooting flow


Clocking troubleshooting
Sleep clock functionality OK? (32.768kHz) on testpoint J2207
NO
Sleep clock functionality OK? (32.768kHz) on B2200
YES
Is VBACK at G2200>1.5V?
YES
Change EM ASIC (N2200).
NO
Change B2200.
NO
Change G2200.
NO
System clock functionality OK at D2800 input ? J2800 and J2801 38.4MHz differential clock.
YES
Clocks OK.
NO
Check voltages of VCTCXO G7500. R7501=VR1=2.5V, R7502=AFC=~1.2-1.5V in room temperature?
YES
Change VCTCXO (G7500).
YES
System clock functionality OK at D2800 input ? J2800 and J2801 38.4MHz differential clock
YES
Clocks OK.
NO
Change EM ASIC (N2200).
NO
Change N7500.

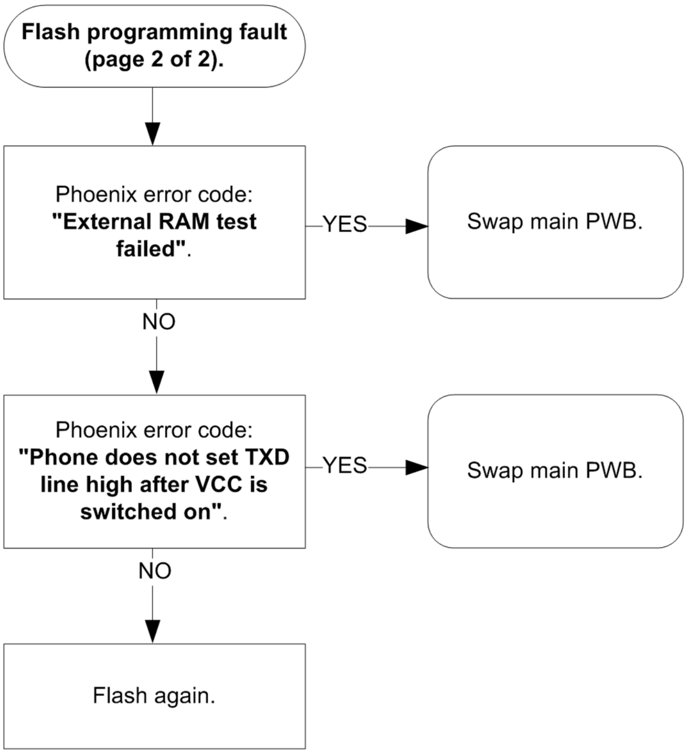
Interface troubleshooting

Flash programming fault troubleshooting

Troubleshooting flow - Page 1 of 2


Flash programming fault (page 1 of 2).
Check that SW packages are correct and reflash the phone.
OK
END
Comment: Phoenix error codes help to find out in which step flashing fails.
NOK
Test flashing through test pattern.
Does the flashing procedure start at all?
OK
Go to "Flash programming fault" page 2.
NOK
NOK
Measure resistance between: USB pin D+ USB pin D- >40 ohm
OK
Replace USB ISP (D3300)
Measure FBUS line (Test pattern) after start up. Is FBUS high (1.8V)?
NOK USB Flashing
NOK Flashing via production test pattern
Measure internal FBUS RX line testpad during flashing. See oscilloscope flashing picture. Signal OK?
NOK
Check connections
OK
Measure if short circuit between RX and GND
OK
Remove R2061
OK
Measure internal FBUS TX line testpad during flashing. 1.8V?
OK
OK
NOK
Swap RAPU (D2800)
NOK
Measure if short circuit between RX and GND
OK
Restart flashing
See oscilloscope flashing picture.
Measure BSI pulse (X2070) in flash programming start (2.5V).
NOK
Check EM ASIC (N2200). Replace if necessary.
OK
See oscilloscope flashing picture.
Measure that PURX goes low after BSI pulse.
NOK
Swap EM ASIC (N2200)
OK
See oscilloscope flashing picture.
Measure FBUS TX line (Test pattern) pin 6 after start up. FBUS should be low after being high.
NOK
Swap main PWB
OK
Check manufacturer ID and device ID.
NOK
Replace component which has wrong ID and restore certificate, see "Certificate restoring".
OK
Go to page 2
1
2
3
4
5
VBUS
D-
D+
ID
GND
TX
SCK2
SCK
GND
RX
RX2
Production test pattern

Troubleshooting flow - Page 2 of 2


Flash programming fault (page 2 of 2).
Phoenix error code: "External RAM test failed".
YES
Swap main PWB.
NO
Phoenix error code: "Phone does not set TXD line high after VCC is switched on".
YES
Swap main PWB.
NO
Flash again.

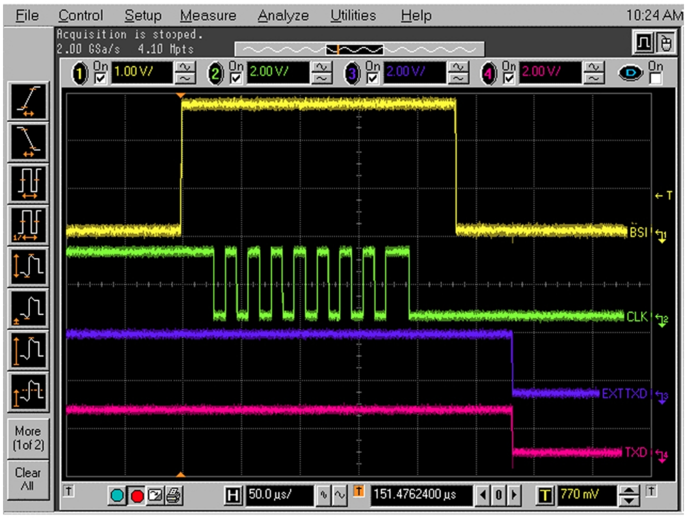
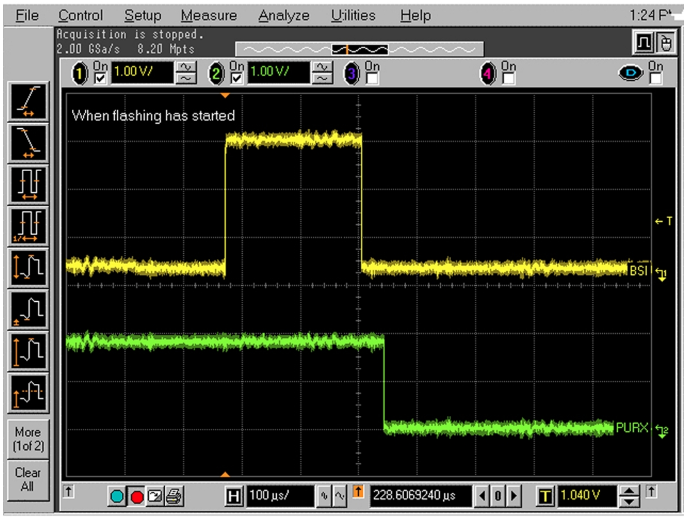

Acquisition is stopped.
2.00 GSa/s 4.10 Mpts
File
Control
Setup
Measure
Analyze
Utilities
Help
10:24 AM
1
On
1.00 V/
2
On
2.00 V/
3
On
2.00 V/
4
On
2.00 V/
On
T
BSI
CLK
EXTTXD
TXD
More (1of 2)
Clear All
H
50.0 µs/
151.4762400 µs
770 mV

Figure 11 Flashing pic 1. Take single trig measurement for the rise of the BSI signal



Acquisition is stopped.
2.00 GSa/s 8.20 Mpts

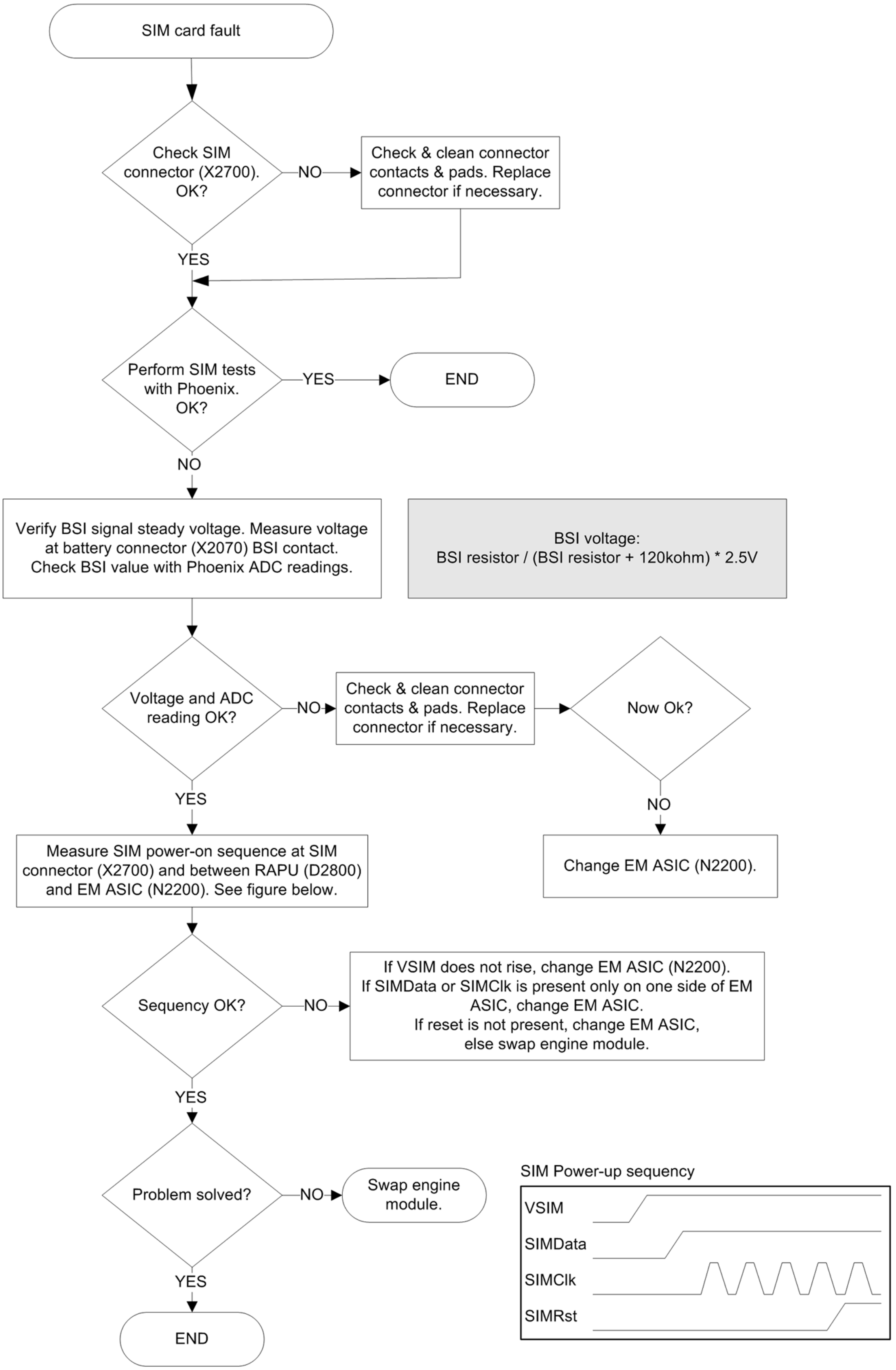
When flashing has started

File
Control
Setup
Measure
Analyze
Utilities
Help
1:24 P
1
On
1.00 V/
2
On
1.00 V/
3
On
4
On
On
← T
BSI
PURX
More
(1of 2)
Clear
All
H
100 µs/
228.6069240 µs
T
1.040 V

Figure 12 Flashing pic 2. Take single trig measurement for the rise of the BSI signal

SIM card troubleshooting

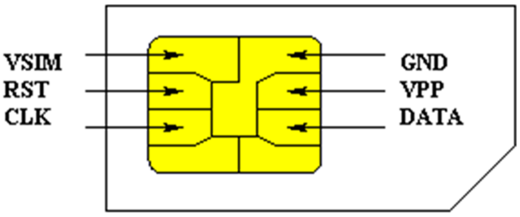
Troubleshooting flow


SIM card fault
Check SIM connector (X2700). OK?
NO
Check & clean connector contacts & pads. Replace connector if necessary.
YES
Perform SIM tests with Phoenix. OK?
YES
END
NO
Verify BSI signal steady voltage. Measure voltage at battery connector (X2070) BSI contact. Check BSI value with Phoenix ADC readings.
BSI voltage:
BSI resistor / (BSI resistor + 120kohm) * 2.5V
Voltage and ADC reading OK?
NO
Check & clean connector contacts & pads. Replace connector if necessary.
Now Ok?
NO
Change EM ASIC (N2200).
YES
Measure SIM power-on sequence at SIM connector (X2700) and between RAPU (D2800) and EM ASIC (N2200). See figure below.
Sequency OK?
NO
If VSIM does not rise, change EM ASIC (N2200).
If SIMData or SIMClk is present only on one side of EM ASIC, change EM ASIC.
If reset is not present, change EM ASIC, else swap engine module.
YES
Problem solved?
NO
Swap engine module.
YES
END
SIM Power-up sequency
VSIM
SIMData
SIMClk
SIMRst

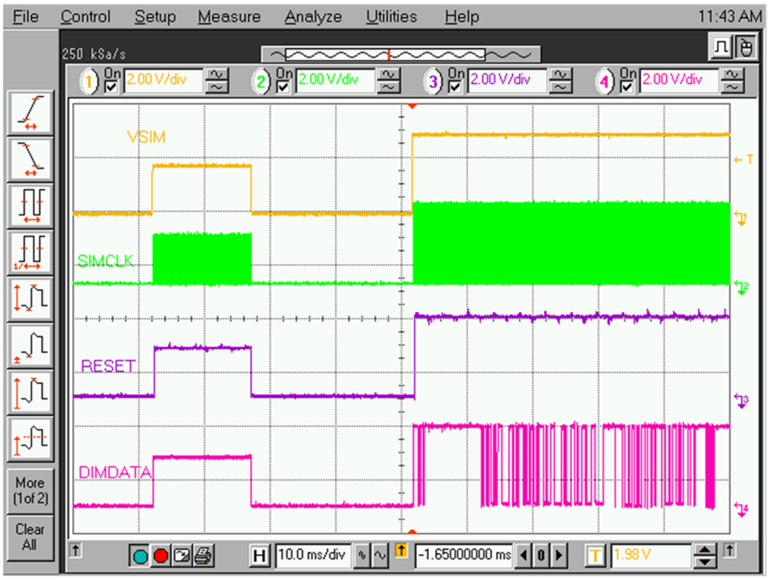
SIM power-on sequence

Testpoints between
RAPU and EM ASIC
J2218 = SIMData
J2219 = SIMClk
J2220 = SIMIOC

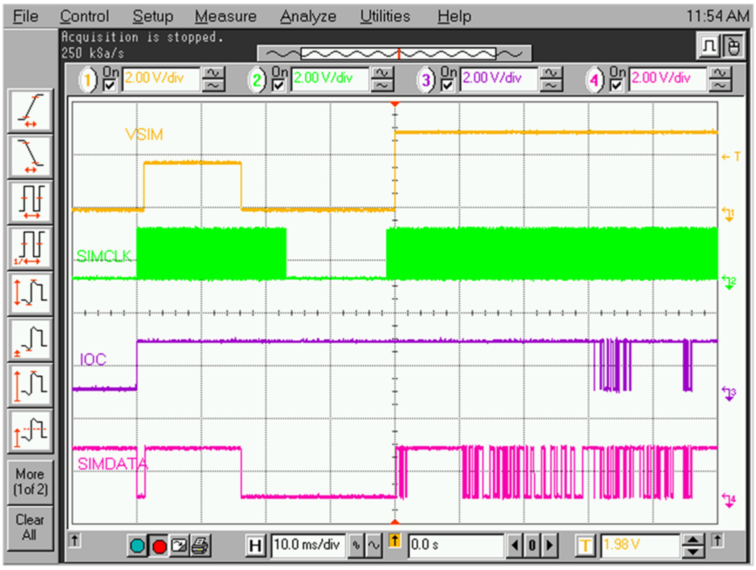
Fsimclk = 3.8MHz


VSIM
RST
CLK
GND
VPP
DATA

SIM contacts


File
Control
Setup
Measure
Analyze
Utilities
Help
11:43 AM
250 kSa/s
2.00 V/div
2.00 V/div
2.00 V/div
2.00 V/div
VSIM
SIMCLK
RESET
DIMDATA
More (1of 2)
Clear All
10.0 ms/div
-1.65000000 ms
1.98 V

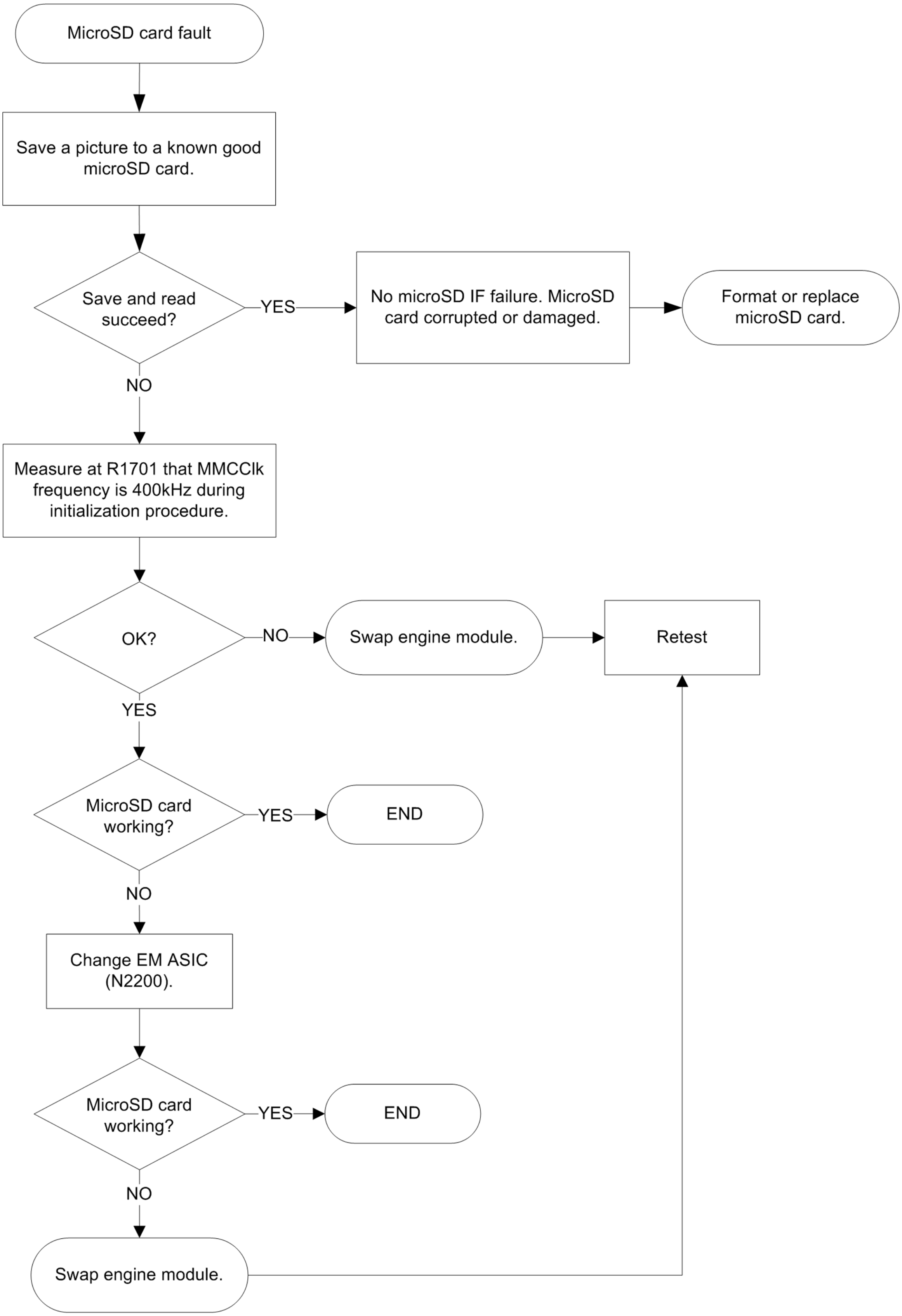
SIM power-on sequence on X2700.


File
Control
Setup
Measure
Analyze
Utilities
Help
11:54 AM
Acquisition is stopped.
250 kSa/s
2.00 V/div
2.00 V/div
2.00 V/div
2.00 V/div
VSIM
SIMCLK
IOC
SIMDATA
More (1of 2)
Clear All
10.0 ms/div
0.0 s
1.98 V

SIM power-on sequence between RAPU and EM ASIC.

MicroSD card troubleshooting

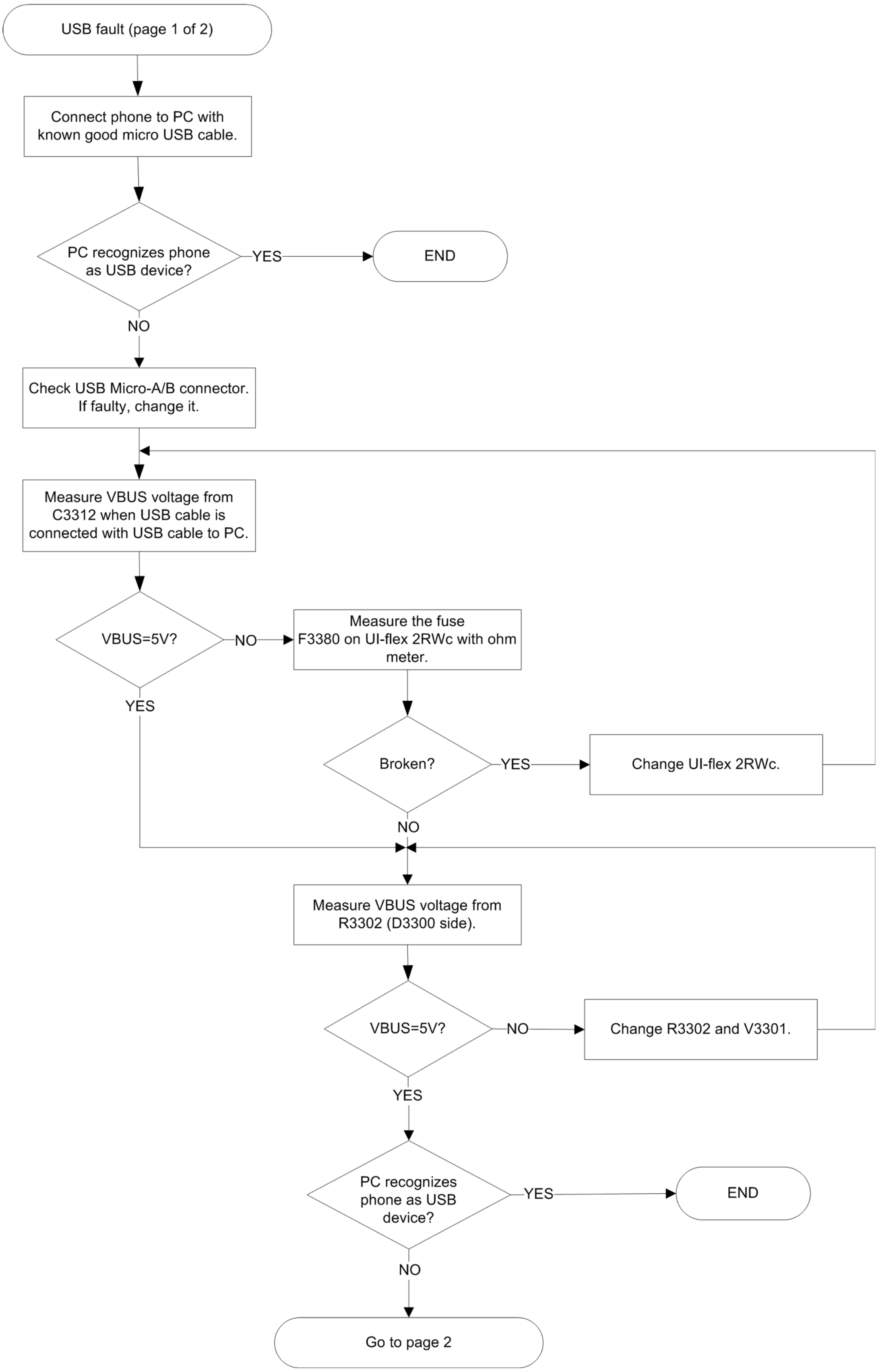
Troubleshooting flow


MicroSD card fault
Save a picture to a known good microSD card.
Save and read succeed?
YES
No microSD IF failure. MicroSD card corrupted or damaged.
Format or replace microSD card.
NO
Measure at R1701 that MMCClk frequency is 400kHz during initialization procedure.
OK?
NO
Swap engine module.
Retest
YES
MicroSD card working?
YES
END
NO
Change EM ASIC (N2200).
MicroSD card working?
YES
END
NO
Swap engine module.

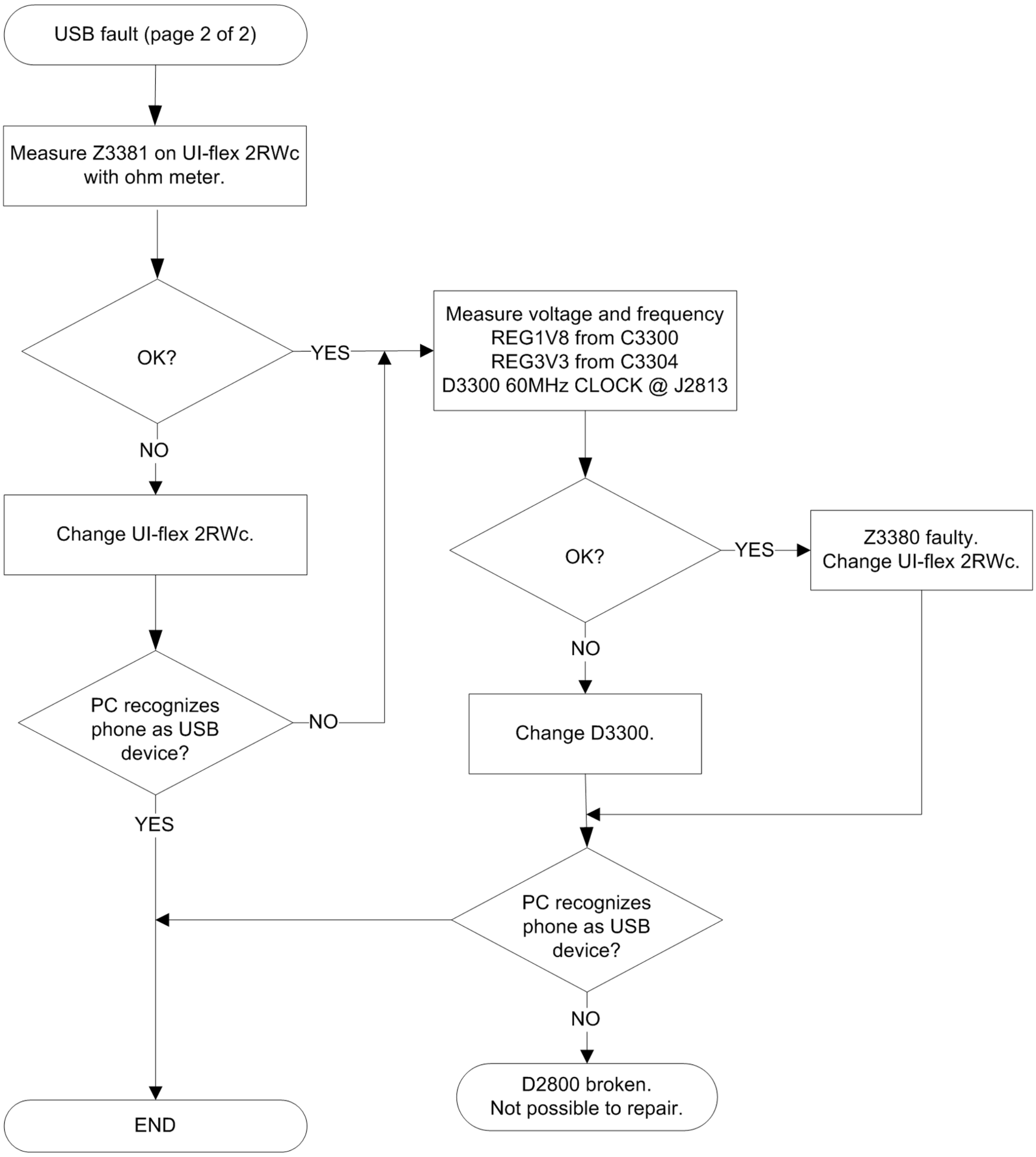
USB troubleshooting

USB data interface troubleshooting

Troubleshooting flow - Page 1 of 2

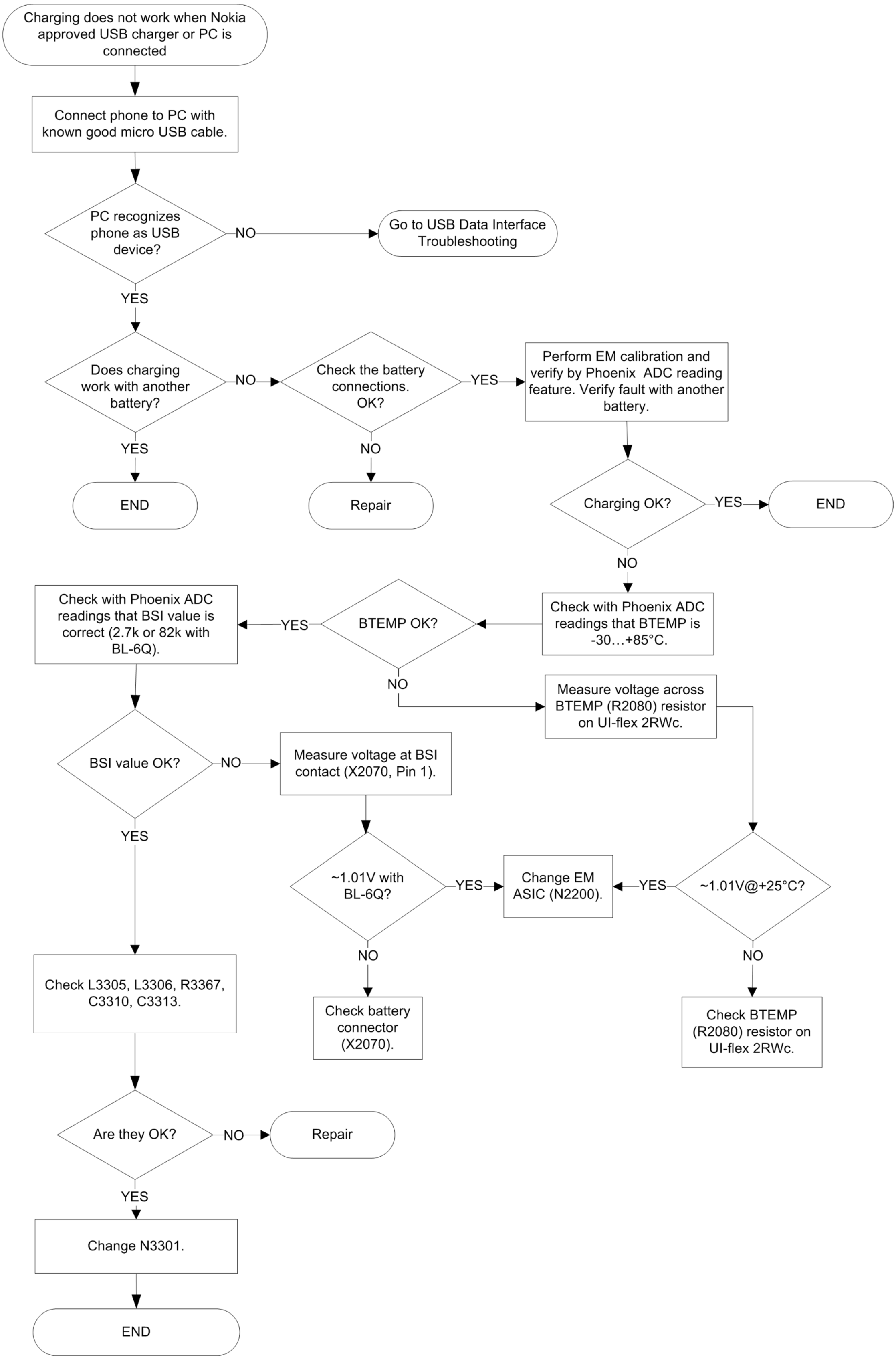

USB fault (page 1 of 2)
Connect phone to PC with known good micro USB cable.
PC recognizes phone as USB device?
YES
END
NO
Check USB Micro-A/B connector. If faulty, change it.
Measure VBUS voltage from C3312 when USB cable is connected with USB cable to PC.
VBUS=5V?
NO
Measure the fuse F3380 on UI-flex 2RWc with ohm meter.
YES
Broken?
YES
Change UI-flex 2RWc.
NO
Measure VBUS voltage from R3302 (D3300 side).
VBUS=5V?
NO
Change R3302 and V3301.
YES
PC recognizes phone as USB device?
YES
END
NO
Go to page 2

Troubleshooting flow - Page 2 of 2


USB fault (page 2 of 2)
Measure Z3381 on UI-flex 2RWc with ohm meter.
OK?
YES
NO
Change UI-flex 2RWc.
PC recognizes phone as USB device?
NO
YES
Measure voltage and frequency
REG1V8 from C3300
REG3V3 from C3304
D3300 60MHz CLOCK @ J2813
OK?
YES
Z3380 faulty. Change UI-flex 2RWc.
NO
Change D3300.
PC recognizes phone as USB device?
NO
D2800 broken. Not possible to repair.
END

USB charging troubleshooting

Troubleshooting flow


Charging does not work when Nokia approved USB charger or PC is connected
Connect phone to PC with known good micro USB cable.
PC recognizes phone as USB device?
NO
Go to USB Data Interface Troubleshooting
YES
Does charging work with another battery?
NO
Check the battery connections. OK?
YES
Perform EM calibration and verify by Phoenix ADC reading feature. Verify fault with another battery.
YES
END
NO
Repair
Charging OK?
YES
END
NO
Check with Phoenix ADC readings that BTEMP is -30…+85°C.
BTEMP OK?
YES
Check with Phoenix ADC readings that BSI value is correct (2.7k or 82k with BL-6Q).
NO
Measure voltage across BTEMP (R2080) resistor on UI-flex 2RWc.
BSI value OK?
NO
Measure voltage at BSI contact (X2070, Pin 1).
YES
~1.01V with BL-6Q?
YES
Change EM ASIC (N2200).
YES
~1.01V@+25°C?
NO
Check battery connector (X2070).
NO
Check BTEMP (R2080) resistor on UI-flex 2RWc.
Check L3305, L3306, R3367, C3310, C3313.
Are they OK?
NO
Repair
YES
Change N3301.
END

User interface troubleshooting

Keyboard and side keys troubleshooting

Context

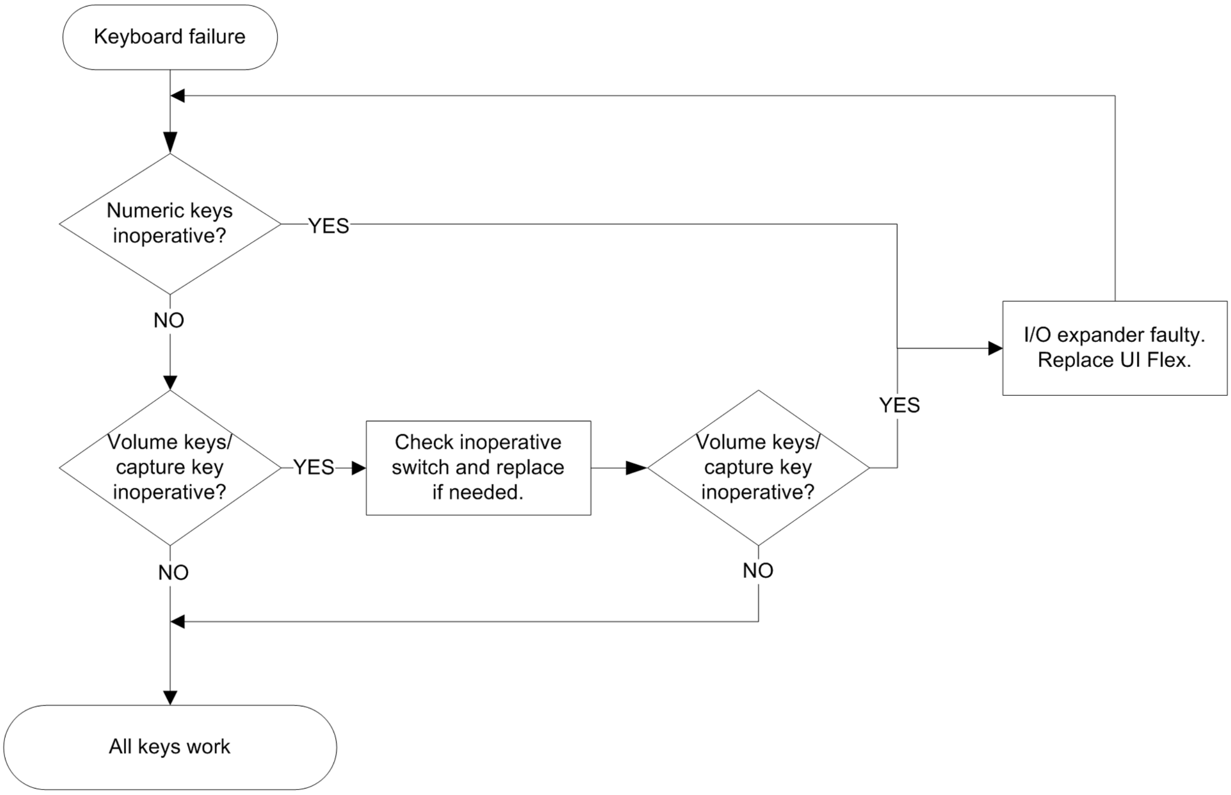
Possible failure mode in the keyboard module:

- One or more keys are stuck, so that the key does not react when a keydome or a side key is pressed. This kind of failure is caused by mechanical reasons (dirt, rust, mechanical damage, etc.)

If the failure mode is not clear, start with the Keyboard test in Phoenix.

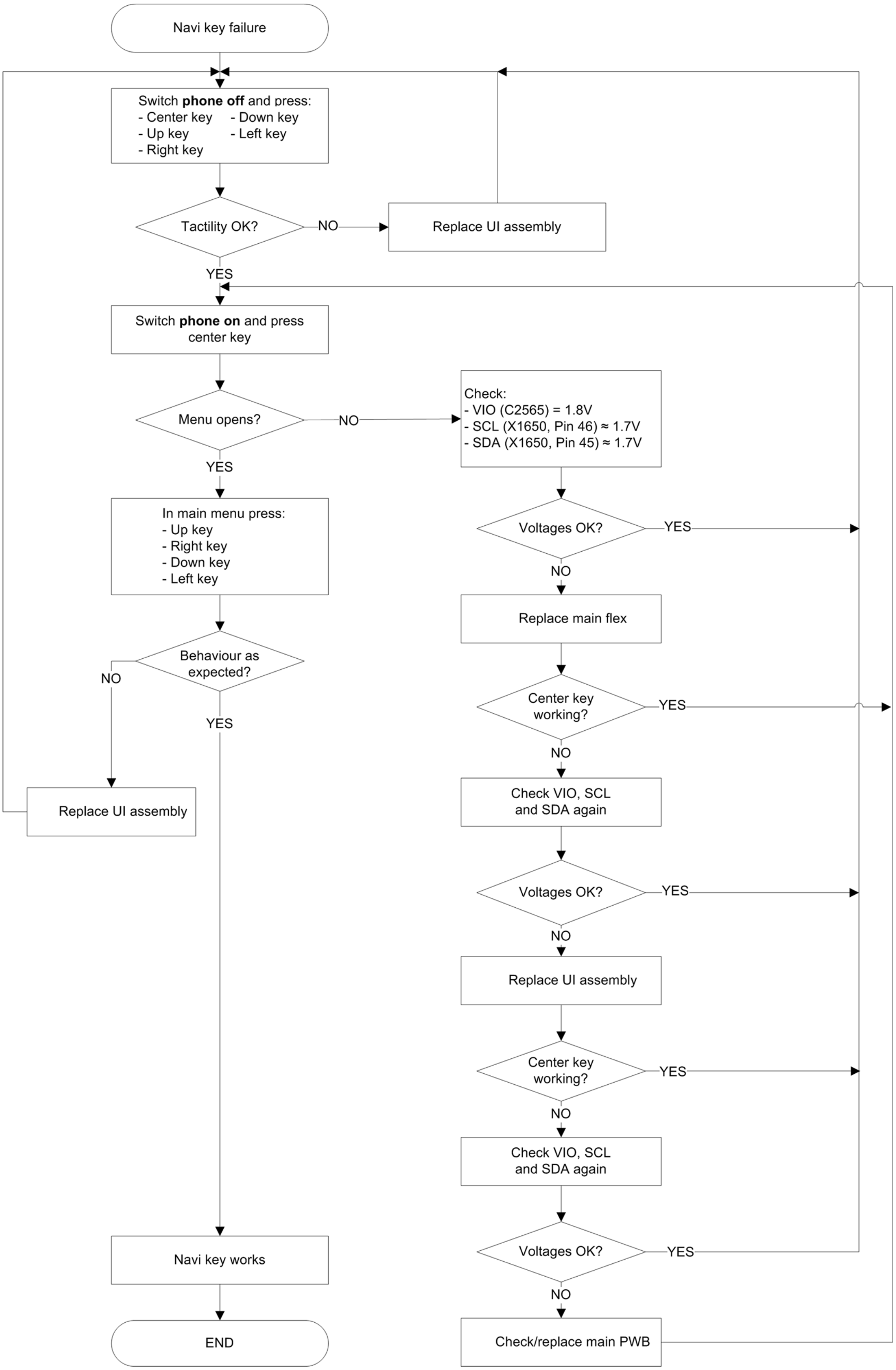
In this phone the keyboard is connected to RAPU via an I/O Expander. RAPU controls the I/O Expander by the I2C bus.

Troubleshooting flow


Keyboard failure
Numeric keys inoperative?
YES
NO
I/O expander faulty. Replace UI Flex.
YES
Volume keys/ capture key inoperative?
YES
Check inoperative switch and replace if needed.
Volume keys/ capture key inoperative?
NO
NO
All keys work

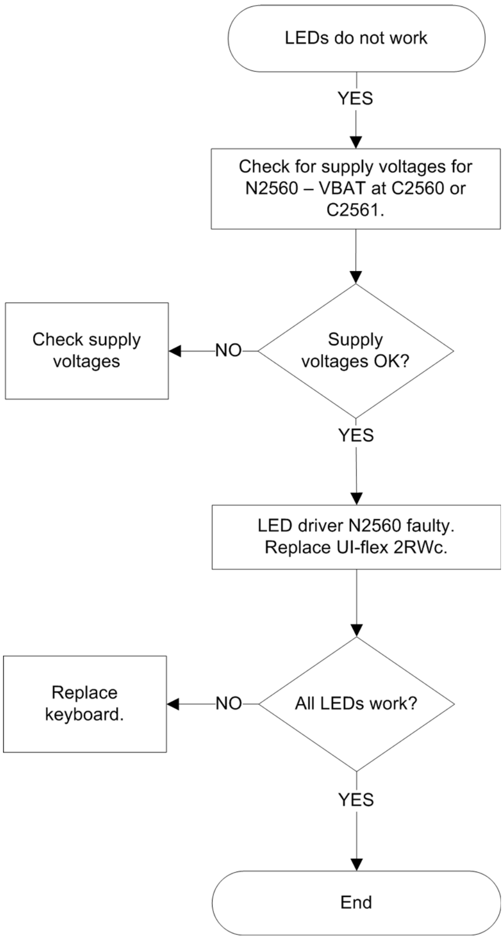
Navi key troubleshooting

Troubleshooting flow


Navi key failure
Switch **phone off** and press:
- Center key
- Down key
- Up key
- Left key
- Right key
Tactility OK?
NO
Replace UI assembly
YES
Switch **phone on** and press center key
Menu opens?
NO
Check:
- VIO (C2565) = 1.8V
- SCL (X1650, Pin 46) ≈ 1.7V
- SDA (X1650, Pin 45) ≈ 1.7V
YES
In main menu press:
- Up key
- Right key
- Down key
- Left key
Voltages OK?
YES
NO
Replace main flex
Behaviour as expected?
NO
YES
Center key working?
YES
NO
Replace UI assembly
Check VIO, SCL and SDA again
Voltages OK?
YES
NO
Replace UI assembly
Center key working?
YES
NO
Check VIO, SCL and SDA again
Navi key works
Voltages OK?
YES
NO
END
Check/replace main PWB

Keyboard LEDs and Navi key LEDs troubleshooting

Troubleshooting flow


LEDs do not work
YES
Check for supply voltages for N2560 – VBAT at C2560 or C2561.
Check supply voltages
NO
Supply voltages OK?
YES
LED driver N2560 faulty. Replace UI-flex 2RWc.
Replace keyboard.
NO
All LEDs work?
YES
End

Accelerometer self test troubleshooting

Context

The accelerometer is sensitive to all vibrations and movements (including those made by IHF and Vibra). Make sure before starting the troubleshooting that there are no vibrations or movements which could have an impact on the analysis.

The three different axes for the accelerometer are illustrated in the picture below.

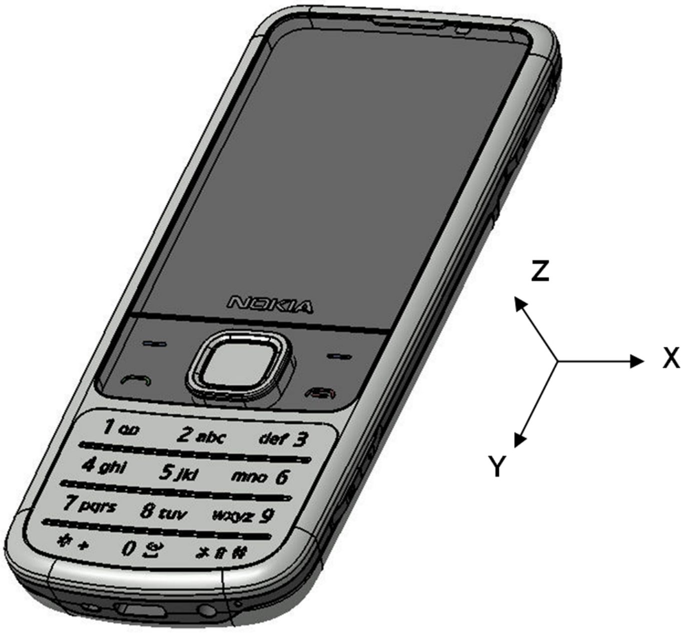
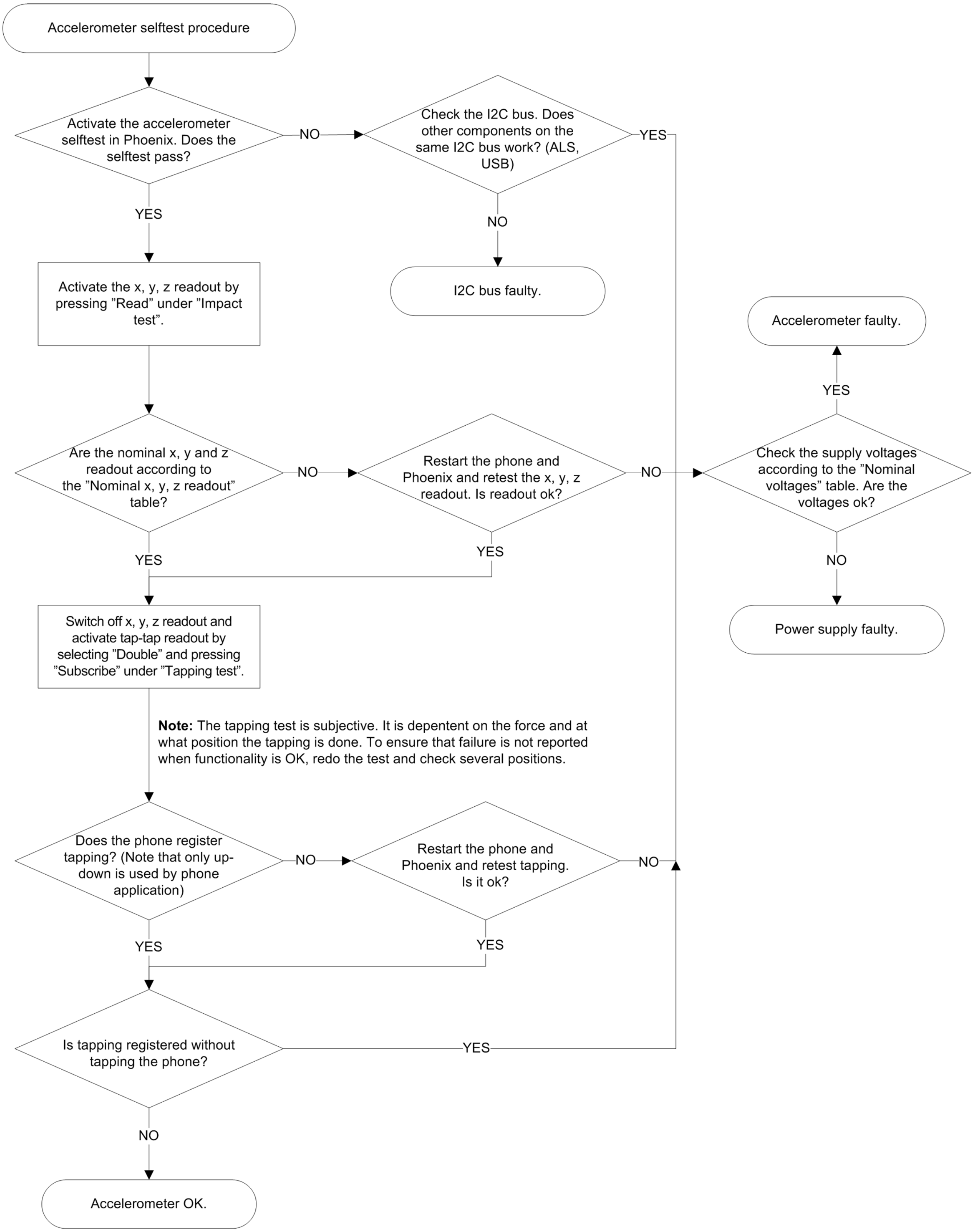


Figure 13 Accelerometer axes

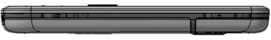
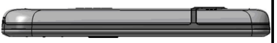
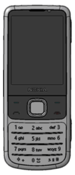
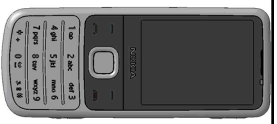
Troubleshooting flow


Accelerometer selftest procedure
Activate the accelerometer selftest in Phoenix. Does the selftest pass?
NO
Check the I2C bus. Does other components on the same I2C bus work? (ALS, USB)
YES
NO
I2C bus faulty.
YES
Activate the x, y, z readout by pressing "Read" under "Impact test".
Accelerometer faulty.
YES
Are the nominal x, y and z readout according to the "Nominal x, y, z readout" table?
NO
Restart the phone and Phoenix and retest the x, y, z readout. Is readout ok?
NO
Check the supply voltages according to the "Nominal voltages" table. Are the voltages ok?
YES
YES
NO
Power supply faulty.
Switch off x, y, z readout and activate tap-tap readout by selecting "Double" and pressing "Subscribe" under "Tapping test".
Does the phone register tapping? (Note that only up-down is used by phone application)
NO
Restart the phone and Phoenix and retest tapping. Is it ok?
NO
YES
YES
Is tapping registered without tapping the phone?
YES
NO
Accelerometer OK.

Note: The tapping test is subjective. It is depentent on the force and at what position the tapping is done. To ensure that failure is not reported when functionality is OK, redo the test and check several positions.

Symptoms and diagnosis

Table 6 Nominal x, y, z readout

Position		Nominal readout X	Nominal readout Y	Nominal readout Z
	Phone lying flat on table. Display up.	0.0	0.0	1.0
	Phone lying flat on table. Display down.	0.0	0.0	-1.0
	Holding the phone horizontal	0.0	1.0	0.0
	Holding the phone right side down	-1.0	0.0	0.0

The impact test is done with the phone in four different positions to test all axes. The table presents the nominal value readout value for x, y and z axis in the different phone positions. Tolerance +/- 0.9

Table 7 Nominal voltages

Supply	Measure on	Nominal voltage
VAUX2	C6575 C6576	2.5 V
VIO	C6577	1.8 V

Display module troubleshooting

General instructions for display troubleshooting

Context

- The display is in a normal mode when the phone is in active use.
- The operating modes of the display can be controlled with the help of *Phoenix*.

Table 8 Display module troubleshooting cases

Display blank	There is no image on the display. The display looks the same when the phone is on as it does when the phone is off. The backlight can be on in some cases.
Image on the display not correct	Image on the display can be corrupted or a part of the image can be missing. • If a part of the image is missing, change the display module. • If the image is otherwise corrupted, follow the display fault troubleshooting flowchart.

Backlight dim or not working at all	Backlight LED components are inside the display module. Backlight failure can also be in the connector or in the backlight power source in the main engine of the phone. This means that in case the display is working (image OK), the backlight is faulty.
Visual defects (pixel)	Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen. The display may have some random pixel defects that are acceptable for this type of display. The criteria when pixel defects are regarded as a display failure, resulting in a replacement of the display, are presented the following table.

Table 9 Pixel defects

Item		White dot defect				Black dot defect	Total
1	Defect counts	R	G	B	White Dot Total	1	1
		1	1	1	1		
2	Combined defect counts	Not allowed. Two single dot defects that are within 5 mm of each other should be interpreted as combined dot defect.					

Steps

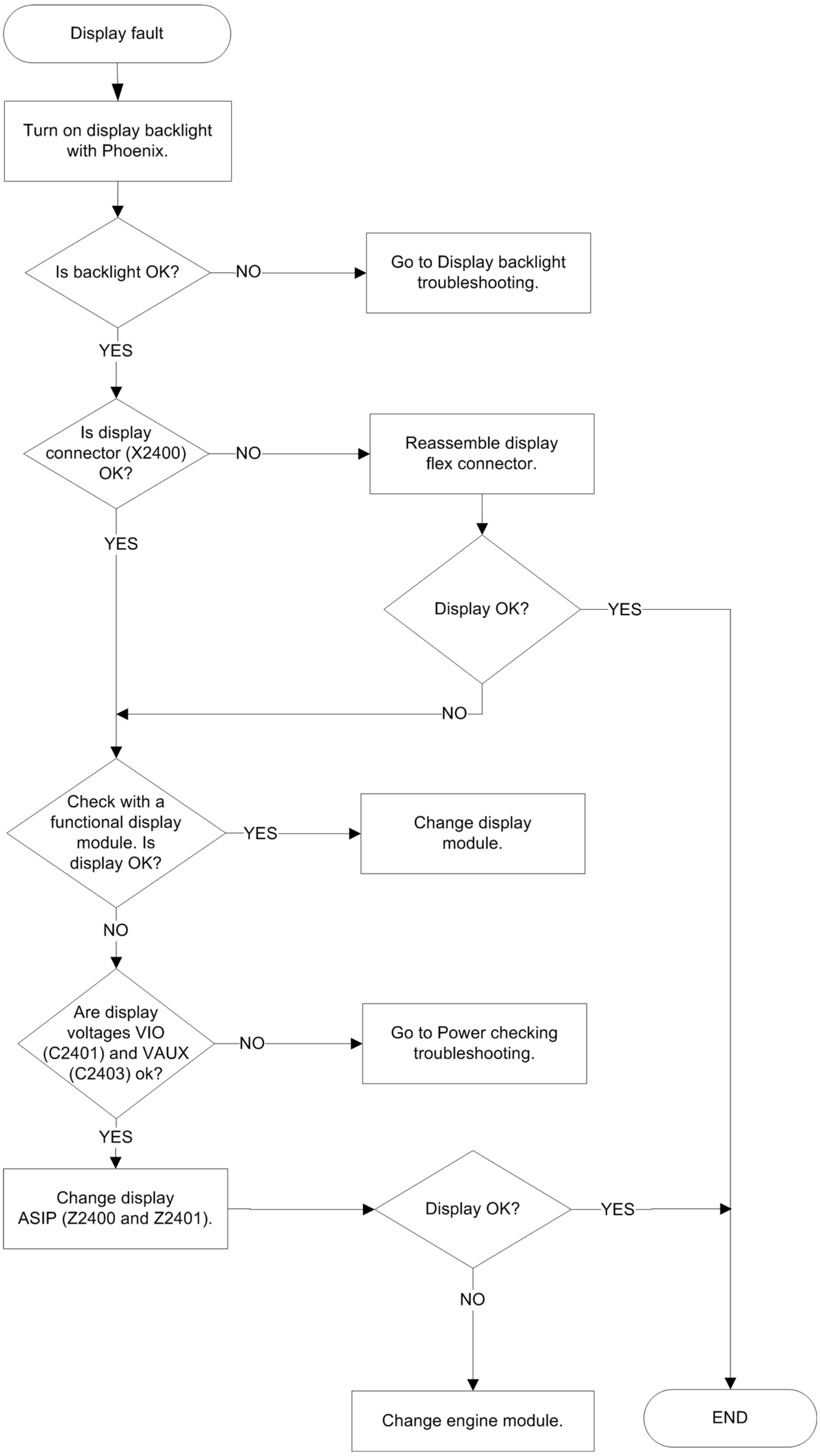
1. Verify with a working display that the fault is not on the display module itself.

   The display module cannot be repaired.
2. Check that the cellular engine is working normally.
   - i To check the functionality, connect the phone to a docking station.
   - ii Start *Phoenix* service software.
   - iii Read the phone information to check that also the application engine is functioning normally (you should be able to read the APE ID).
3. Proceed to the display fault troubleshooting flowchart.

   Use the **Display Test** tool in *Phoenix* to find the detailed fault mode.

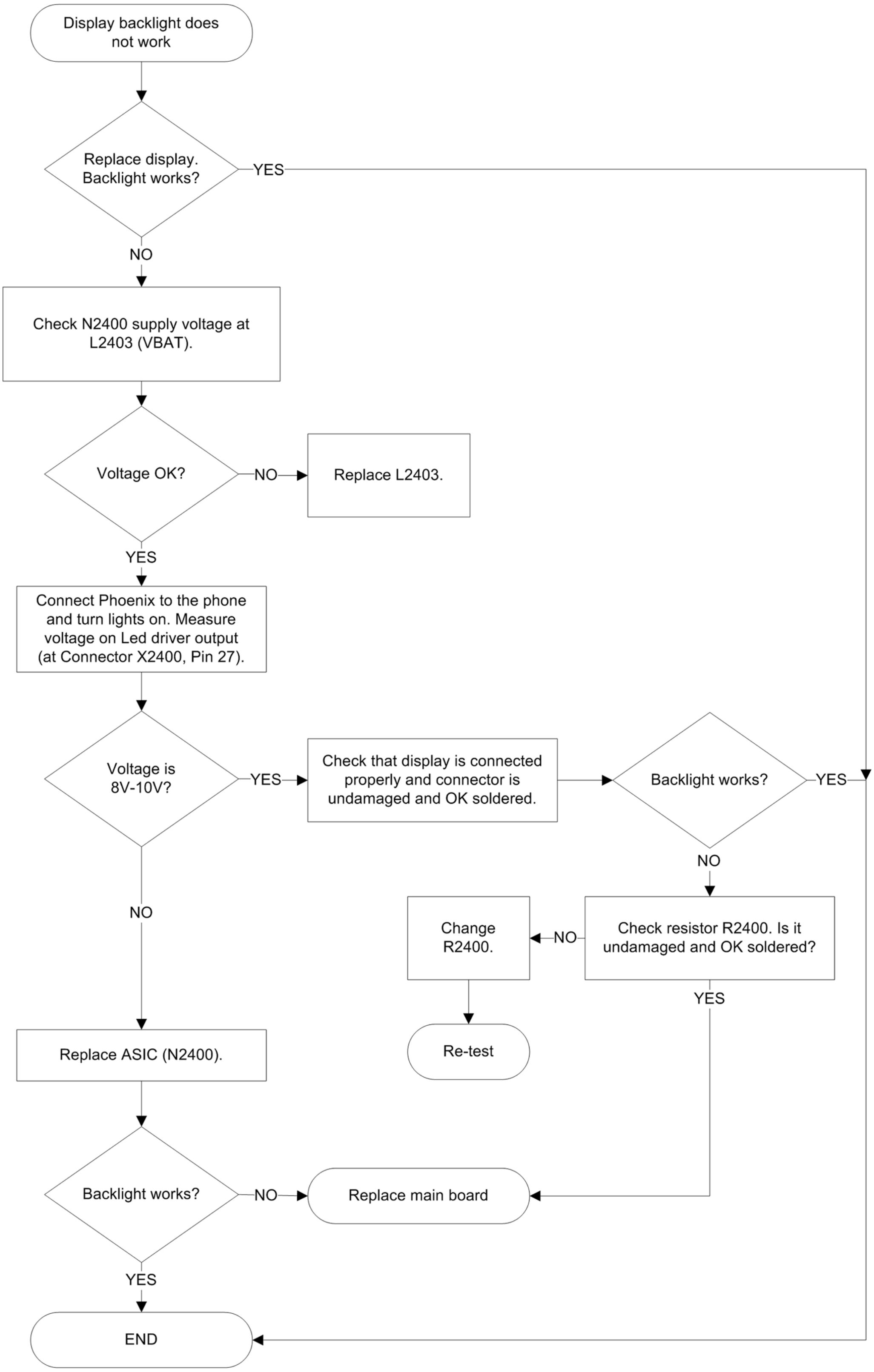
Display fault troubleshooting

Troubleshooting flow


Display fault
Turn on display backlight with Phoenix.
Is backlight OK?
NO
Go to Display backlight troubleshooting.
YES
Is display connector (X2400) OK?
NO
Reassemble display flex connector.
YES
Display OK?
YES
NO
Check with a functional display module. Is display OK?
YES
Change display module.
NO
Are display voltages VIO (C2401) and VAUX (C2403) ok?
NO
Go to Power checking troubleshooting.
YES
Change display ASIP (Z2400 and Z2401).
Display OK?
YES
NO
Change engine module.
END

Display backlight troubleshooting

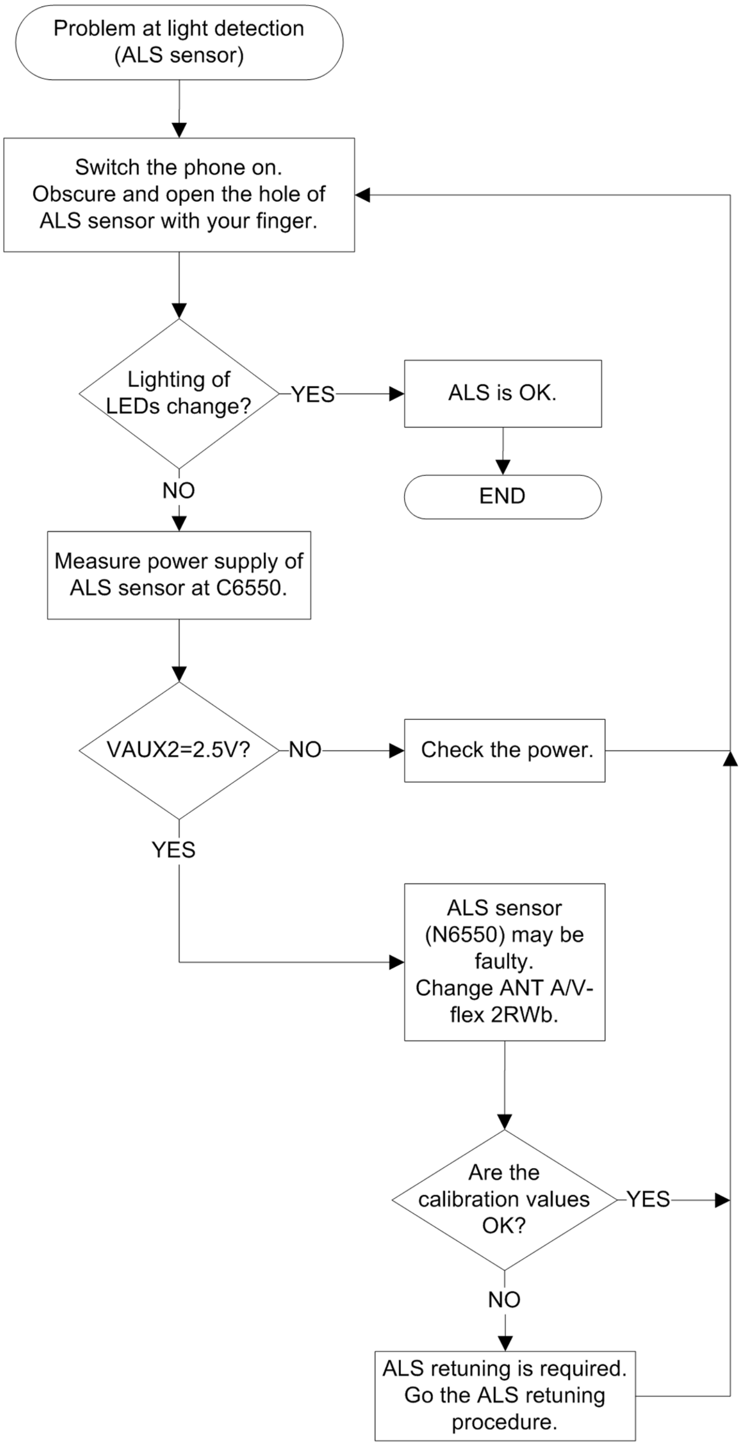
Troubleshooting flow


Display backlight does not work
Replace display. Backlight works?
YES
NO
Check N2400 supply voltage at L2403 (VBAT).
Voltage OK?
NO
Replace L2403.
YES
Connect Phoenix to the phone and turn lights on. Measure voltage on Led driver output (at Connector X2400, Pin 27).
Voltage is 8V-10V?
YES
Check that display is connected properly and connector is undamaged and OK soldered.
Backlight works?
YES
NO
Check resistor R2400. Is it undamaged and OK soldered?
NO
Change R2400.
Re-test
YES
NO
Replace ASIC (N2400).
Backlight works?
NO
Replace main board
YES
END

Ambient light sensor (ALS)

ALS troubleshooting

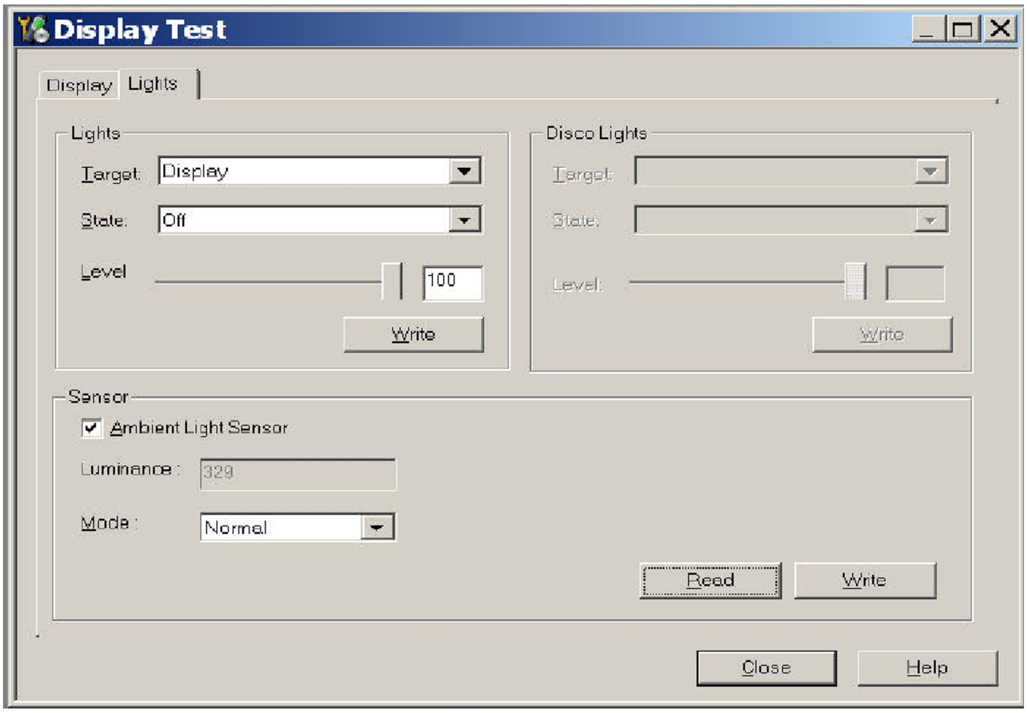
Troubleshooting flow


Problem at light detection (ALS sensor)
Switch the phone on. Obscure and open the hole of ALS sensor with your finger.
Lighting of LEDs change?
YES
ALS is OK.
END
NO
Measure power supply of ALS sensor at C6550.
VAUX2=2.5V?
NO
Check the power.
YES
ALS sensor (N6550) may be faulty. Change ANT A/V-flex 2RWb.
Are the calibration values OK?
YES
NO
ALS retuning is required. Go the ALS retuning procedure.

ALS functionality check

Steps

1. Connect phone to Phoenix and set the phone (e.g. on the table) so that the amount of ambient light seen by ALS is as stable as possible.
2. Start Phoenix
3. Choose **File -> Scan product**
4. Choose **Testing -> Display Test**
5. Open the **Lights** tab, check Ambient Light Sensor check box, click **Read**, cover the sensor and click **Read** again. When covered, Luminance reading should be less than after clicking **Read** without covering the sensor.
6. If component doesn't give any reading or reading doesn't change when sensor is/is not covered, replace the part.



Target: Display
State: Off
Level 100
☑ Ambient Light Sensor
Luminance : 329
Mode : Normal

Note: After replacing the ALS. If calibration values of the new sensor are lost or for some other reason, ALS re-tuning is required (see instructions later in this document).

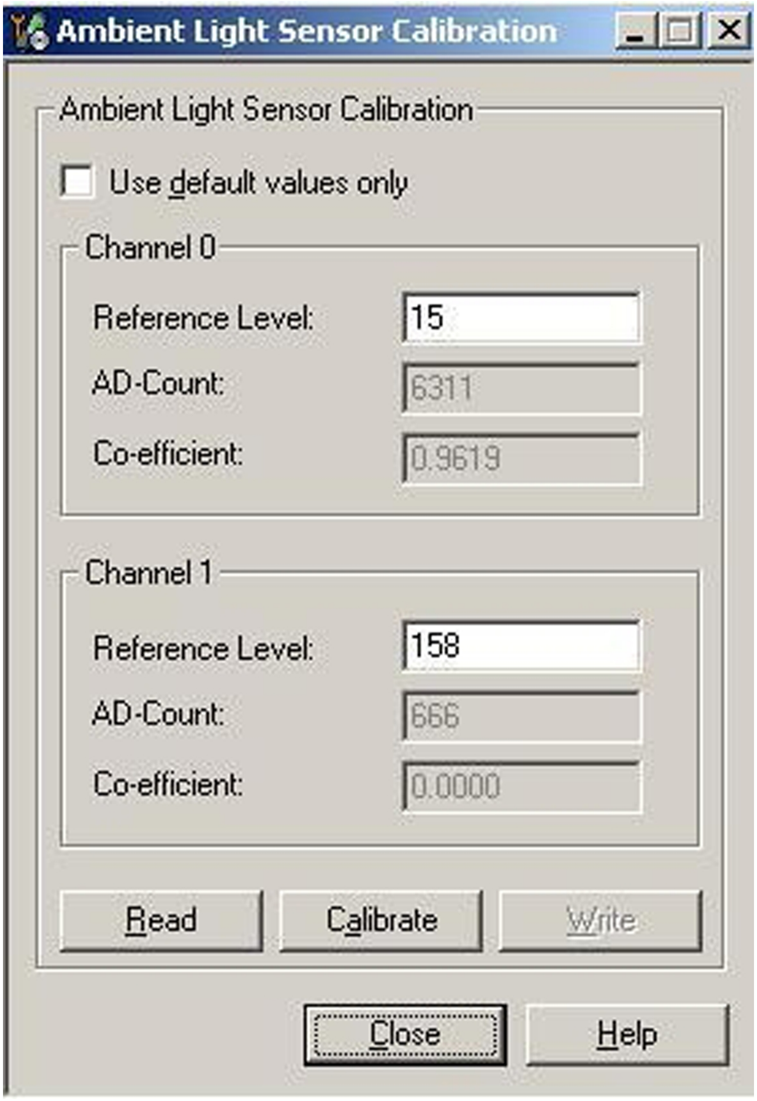
When doing the ALS calibration procedure, it is required to have a reference phone, which includes calibrated ALS. ALS re-tuning instructions show why the reference phone is needed.

ALS retuning

Steps

1. Connect reference phone to *Phoenix* and set the phone (e.g. on the table) so that the amount of ambient light seen by ALS is as stabile as possible.
2. Start *Phoenix*.
3. Choose **File→Scan Product**.

4. Choose **Tuning -> Ambient Light Sensor Calibration**. You should see the following window



Ambient Light Sensor Calibration

Ambient Light Sensor Calibration

☐ Use default values only

Channel 0

Reference Level: 15

AD-Count: 6311

Co-efficient: 0.9619

Channel 1

Reference Level: 158

AD-Count: 666

Co-efficient: 0.0000

5. Read AD-count values for Channel 0 and Channel 1 by click Read button and write them down.
6. Repeat 1-5 for the phone to be calibrated and make sure the phone to be calibrated is located in the same place as reference phone was when luminance reading was taken.
7. Calculate co-efficient from reference phone and phone to be calibrated AD-count values by division: Co-efficient = AD-count(reference phone) / AD-count(phone to be calibrated), write down the calculated co-efficient values.
8. -> Iterate by changing Channel 0 and Channel 1 (reference level) values (remove cross from 'Use default values only'). After writing some value to Channel 0 and Channel 1 (reference value), calibrate button must be pressed. Stop iterating when Co-efficient is equal to Co-efficient calculated in bullet 7. Note that decimal numbers should be used in the iteration in order to achieve enough precision (e.g. 200.2455)
9. After having same Co-efficient value in "Co-efficient" textbox as the calculated value, make sure that ambient light values (read using **Testing** → **Display Test** → **"Luminance"** textbox) are almost the same in reference phone and calibrated phone. Remember that illuminance readings for reference and calibrated phones must be done in the same ambient light conditions. If illuminance values differs a lot (difference max. +- 10%), repeat whole ALS re-tuning procedure.
10. To end the calibration, click **Close**.

GPS troubleshooting

GPS antenna

The GPS antenna is covering the GPS band. The GPS antenna consists of an antenna flex assembled directly onto the A-cover and connects with a pogo pin onto a pad on the top flex.

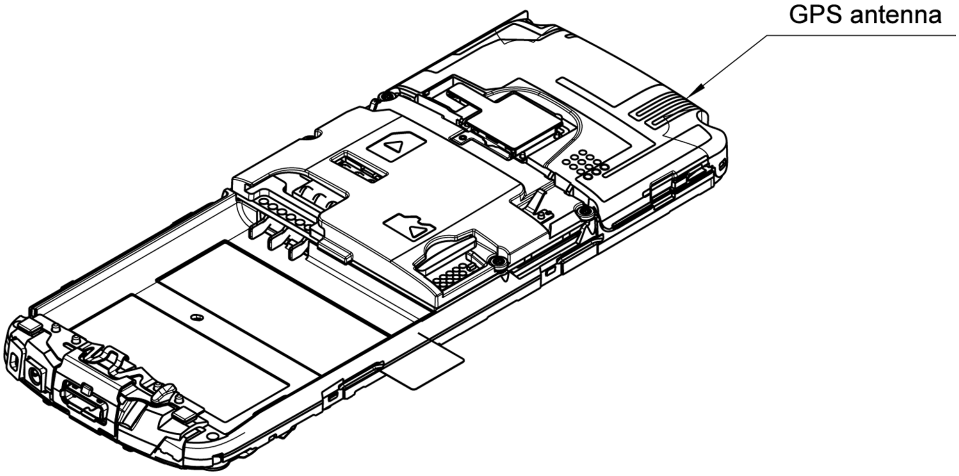

GPS antenna

Figure 14 GPS antenna location

GPS layout and basic test points

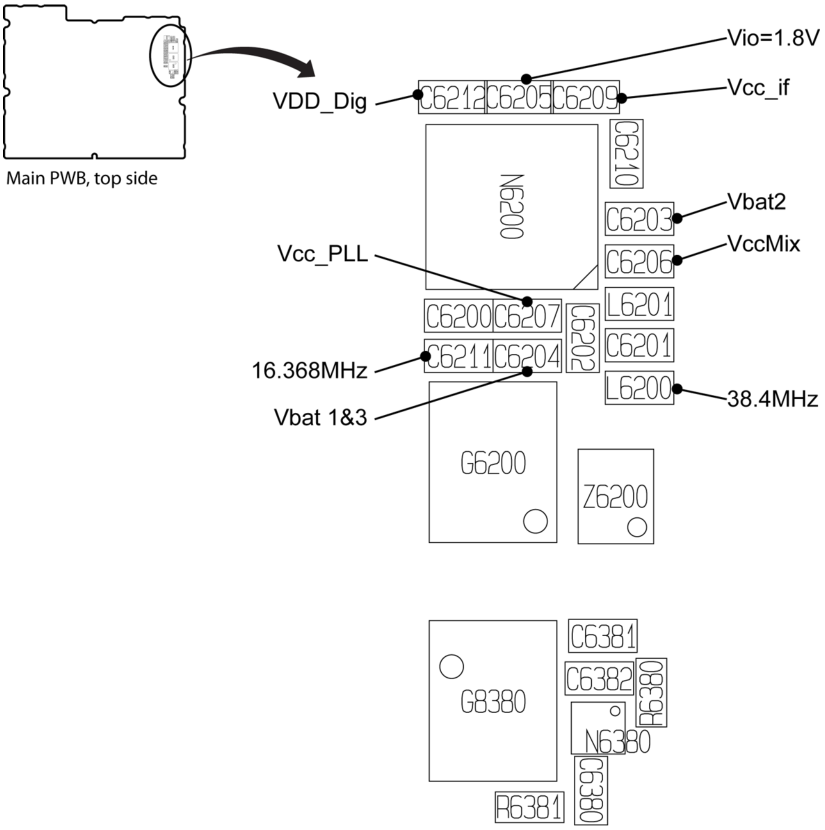

Main PWB, top side
VDD_Dig
Vio=1.8V
Vcc_if
C6212
C6205
C6209
C6210
N6200
C6203
Vbat2
C6206
VccMix
Vcc_PLL
C6200
C6207
C6202
L6201
C6201
16.368MHz
C6211
C6204
L6200
38.4MHz
Vbat 1&3
G6200
Z6200
C6381
C6382
R6380
G8380
N6380
R6381
C6380

Figure 15 GPS layout and basic test points

VBat, ASIC internal LDO voltages, and clocks are available as shown in figure above.

GPS settings for Phoenix

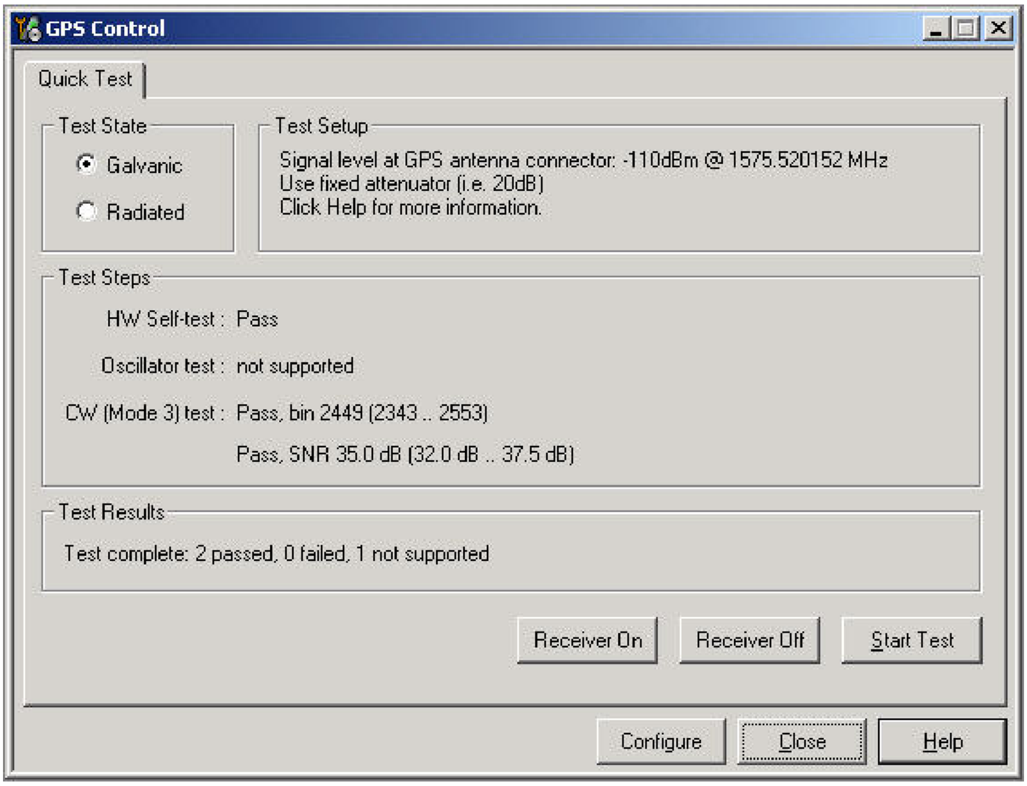
GPS control

Context

Use the following to test GPS using Phoenix.

Steps

1. Start Phoenix service software.
2. From the **File** menu, select **Scan Product** and check that the correct product version is displayed.
3. From the **Testing** menu, select **GPS Control**. This opens up *GPS Control* dialogue box, as shown in the figure below, and enables the GPS.



Test State
● Galvanic
○ Radiated

Test Setup
Signal level at GPS antenna connector: -110dBm @ 1575.520152 MHz
Use fixed attenuator (i.e. 20dB)
Click Help for more information.

Test Steps
HW Self-test : Pass
Oscillator test : not supported
CW (Mode 3) test : Pass, bin 2449 (2343 .. 2553)
Pass, SNR 35.0 dB (32.0 dB .. 37.5 dB)

Test Results
Test complete: 2 passed, 0 failed, 1 not supported

Figure 16 GPS Control dialog box

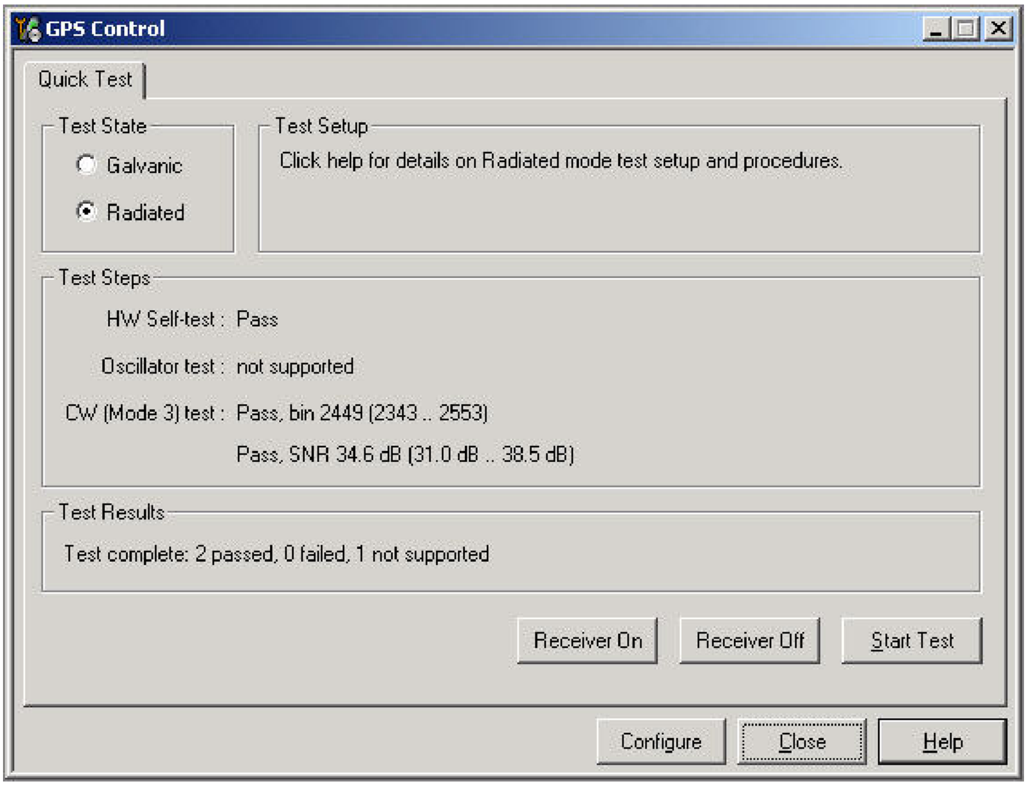
Select **Receiver On** to confirm the GPS is enabled and is in idle mode; at this point all clocks should be present, GPS_En_Reset & SleepX should be high, and Vdd_Dig, Vcc_TCXO & Vcc_PLL/VCO will be present.

Receiver On turns on all RF sections of the ASIC and so all LDOs will be on. These checks are part of GPS basic checks troubleshooting (page 3– 0).

GPS Quick Test window

The *GPS Quick Test* window has all the necessary functionality for GPS troubleshooting. Ensure the test setup is correct and click **Start Test**. (Select **Help** for further information).

This test will perform three tests in one; Self Test, Oscillator Test and CW Test, and will provide a Pass/Fail response. The *GPS Quick Test* window also contains a **Receiver On** button. These checks are part of GPS failure troubleshooting (page 3–41).



Test State

○ Galvanic

● Radiated

Test Setup

Click help for details on Radiated mode test setup and procedures.

Test Steps

HW Self-test : Pass

Oscillator test : not supported

CW (Mode 3) test : Pass, bin 2449 (2343 .. 2553)

Pass, SNR 34.6 dB (31.0 dB .. 38.5 dB)

Test Results

Test complete: 2 passed, 0 failed, 1 not supported

Figure 17 GPS Quick Test window for GPS troubleshooting

GPS RF test points

Checking for a connection between these two test points will confirm that the antenna is working correctly, as well as performing a radiated CW test.

J6280 = GPS Ant

J7451 = GPS Ant Gnd

In order to probe GPS RF test points, inject 1575.52 MHz tone @ -110dBm at the GPS antenna test connector and select **Receiver On**, then probe the GPS RF test points as shown in figure "GPS RF probe points". Compare RF levels with a known reference phone.

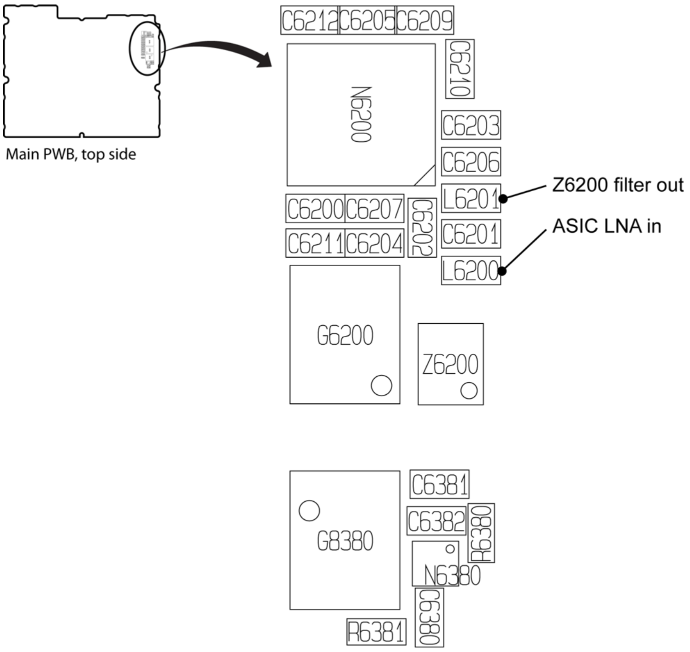

Main PWB, top side
C6212
C6205
C6209
C6210
N6200
C6203
C6206
L6201
Z6200 filter out
ASIC LNA in
C6200
C6207
C6202
C6211
C6204
C6201
L6200
G6200
Z6200
C6381
C6382
R6380
G8380
N6380
C6380
R6381

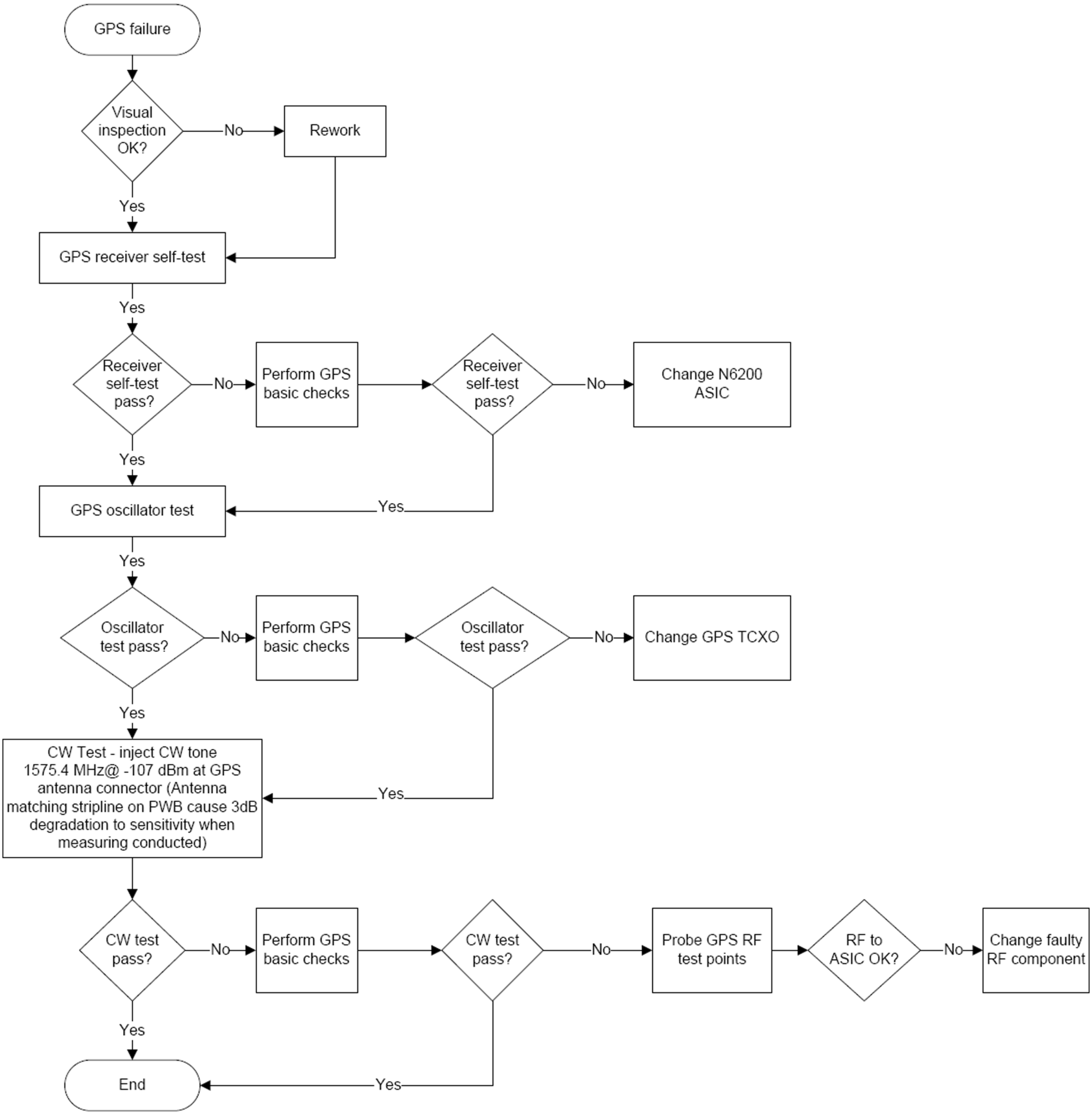
Figure 18 GPS RF probe points

GPS failure troubleshooting

Context

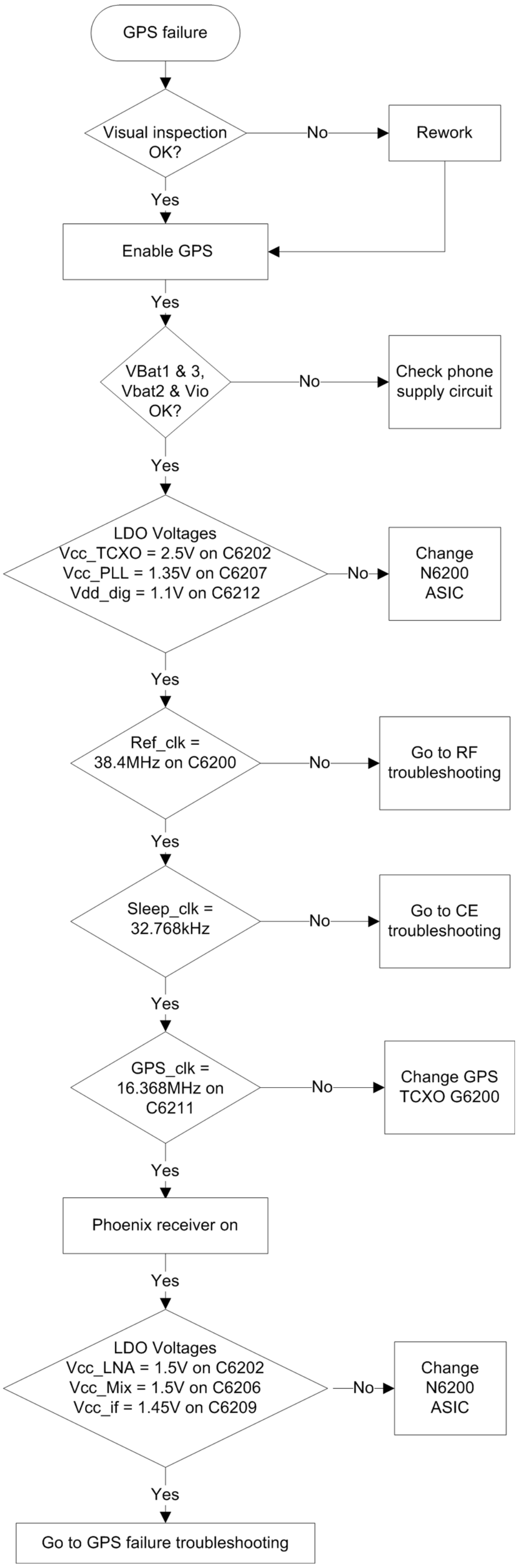
GPS troubleshooting is broken down into two parts: general GPS failure troubleshooting and GPS basic checks troubleshooting. The GPS failure troubleshooting flow can be followed and, where applicable, will feed into the GPS basic checks troubleshooting flow.

Troubleshooting flow


GPS failure
Visual inspection OK?
No
Rework
Yes
GPS receiver self-test
Yes
Receiver self-test pass?
No
Perform GPS basic checks
Receiver self-test pass?
No
Change N6200 ASIC
Yes
Yes
GPS oscillator test
Yes
Oscillator test pass?
No
Perform GPS basic checks
Oscillator test pass?
No
Change GPS TCXO
Yes
Yes
CW Test - inject CW tone 1575.4 MHz@ -107 dBm at GPS antenna connector (Antenna matching stripline on PWB cause 3dB degradation to sensitivity when measuring conducted)
CW test pass?
No
Perform GPS basic checks
CW test pass?
No
Probe GPS RF test points
RF to ASIC OK?
No
Change faulty RF component
Yes
Yes
End

GPS basic checks troubleshooting

Troubleshooting flow


GPS failure
Visual inspection OK?
No
Rework
Yes
Enable GPS
Yes
VBat1 & 3, Vbat2 & Vio OK?
No
Check phone supply circuit
Yes
LDO Voltages
Vcc_TCXO = 2.5V on C6202
Vcc_PLL = 1.35V on C6207
Vdd_dig = 1.1V on C6212
No
Change N6200 ASIC
Yes
Ref_clk = 38.4MHz on C6200
No
Go to RF troubleshooting
Yes
Sleep_clk = 32.768kHz
No
Go to CE troubleshooting
Yes
GPS_clk = 16.368MHz on C6211
No
Change GPS TCXO G6200
Yes
Phoenix receiver on
Yes
LDO Voltages
Vcc_LNA = 1.5V on C6202
Vcc_Mix = 1.5V on C6206
Vcc_if = 1.45V on C6209
No
Change N6200 ASIC
Yes
Go to GPS failure troubleshooting

Camera module troubleshooting

Introduction to camera troubleshooting

Bad conditions often cause bad pictures. Therefore, the camera operation has to be checked in constant conditions or by using a second, known-to-be-good Nokia device as reference. Image quality is hard to measure quantitatively, and the difference between a good and a bad picture can be small. Some training or experience may be needed to detect what is actually wrong.

When checking for possible errors in camera functionality, knowing what error is suspected significantly helps the testing by narrowing down the amount of test cases. The following types of image quality problems are common:

- Dust (black spots)
- Lack of sharpness
- Bit errors

Camera troubleshooting

Taking and evaluating test pictures

When *taking* a test picture, remember the following:

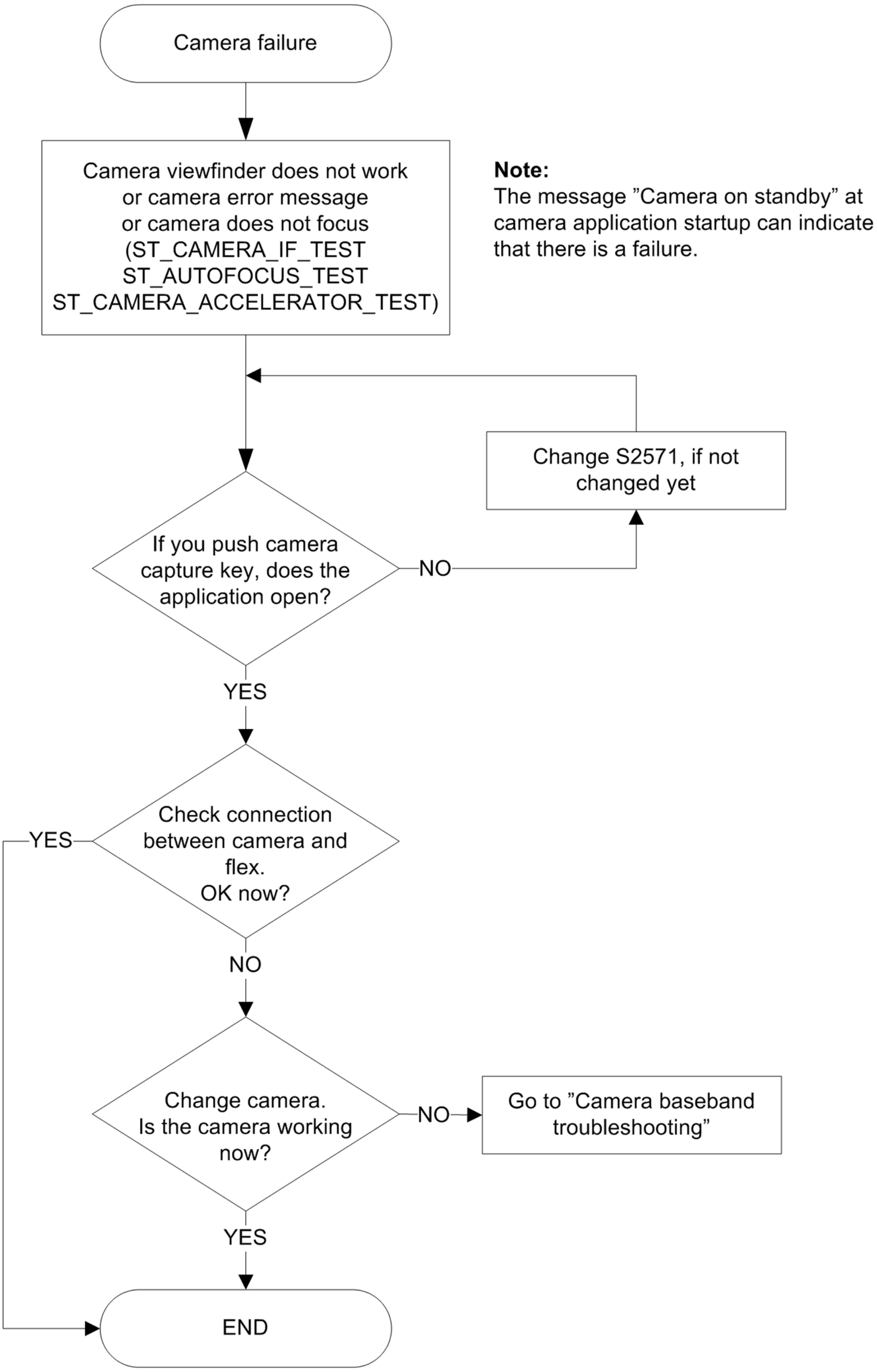
- Avoid bright fluorescent light, 50/60Hz electrical network or high artificial illumination levels
- If the phone is hot, let it rest for a while before taking the picture
- Make sure the optical system is clean
- Use highest possible resolution
- Make sure the light is sufficient (bright office lightning)
- Do not take the picture towards a light source
- Hold the phone as still as possible when taking the picture
- If camera has auto focus: Pictures should be taken both at infinity ~>2m and at macro distance ~10-15 cm in order to verify auto focus functionality

When *evaluating* a test picture, remember the following:

- The center of the picture is sharper than the edges
- The image may be blurred, though it does not show in the viewfinder
- Analyse the picture from your PC monitor, full colour setting is recommended
- If possible, compare with a picture of the same motive taken with a similar Nokia device
- If camera has auto focus: Remember that the white focussing frame which appears when the camera button is pressed halfway down, must turn green for auto focus lock. If the frame turns red, the camera is not focussed!

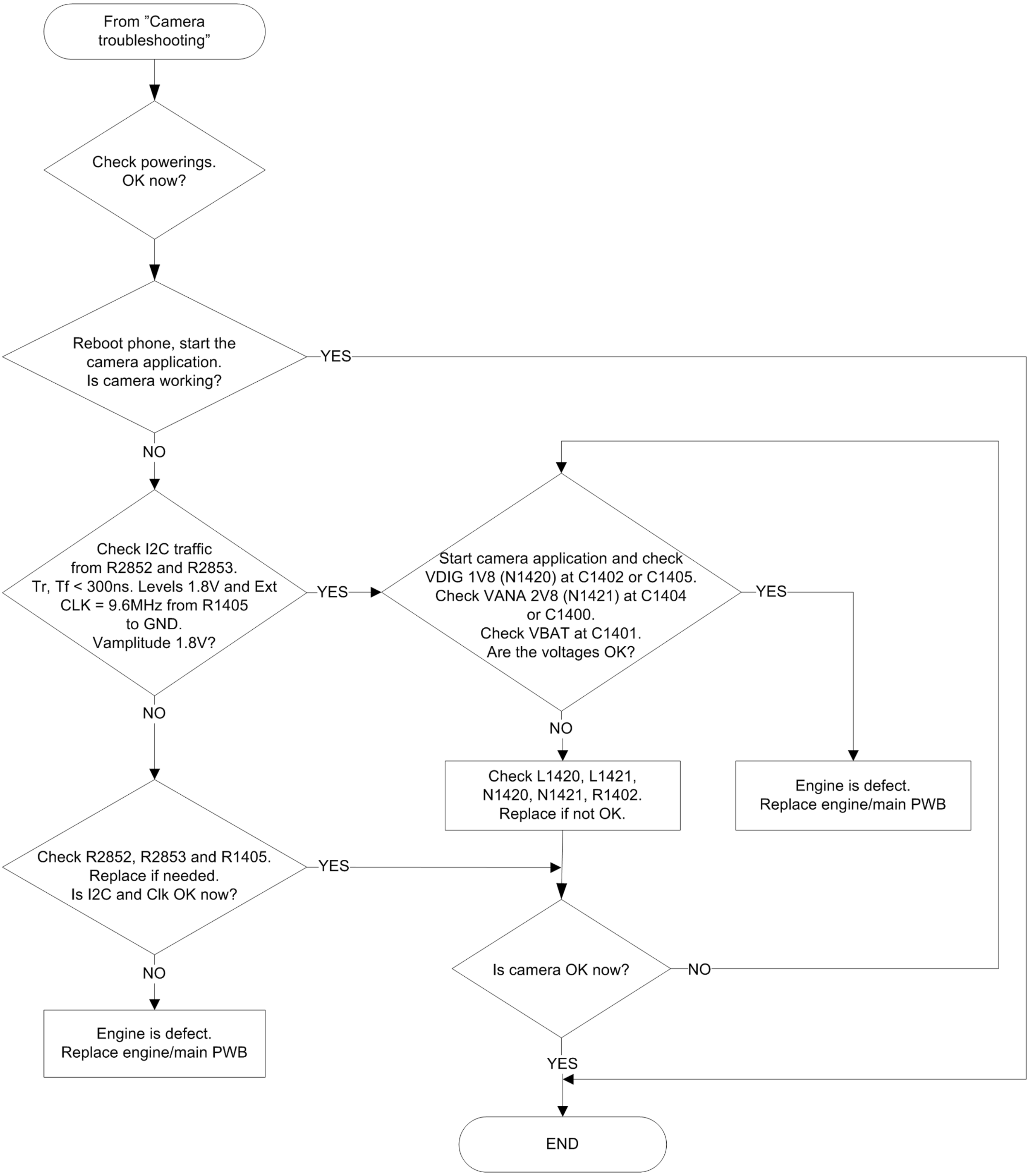
Camera troubleshooting

Troubleshooting flow


Camera failure
Camera viewfinder does not work or camera error message or camera does not focus (ST_CAMERA_IF_TEST ST_AUTOFOCUS_TEST ST_CAMERA_ACCELERATOR_TEST)
Note:
The message ”Camera on standby” at camera application startup can indicate that there is a failure.
Change S2571, if not changed yet
If you push camera capture key, does the application open?
NO
YES
Check connection between camera and flex. OK now?
YES
NO
Change camera. Is the camera working now?
NO
Go to ”Camera baseband troubleshooting”
YES
END

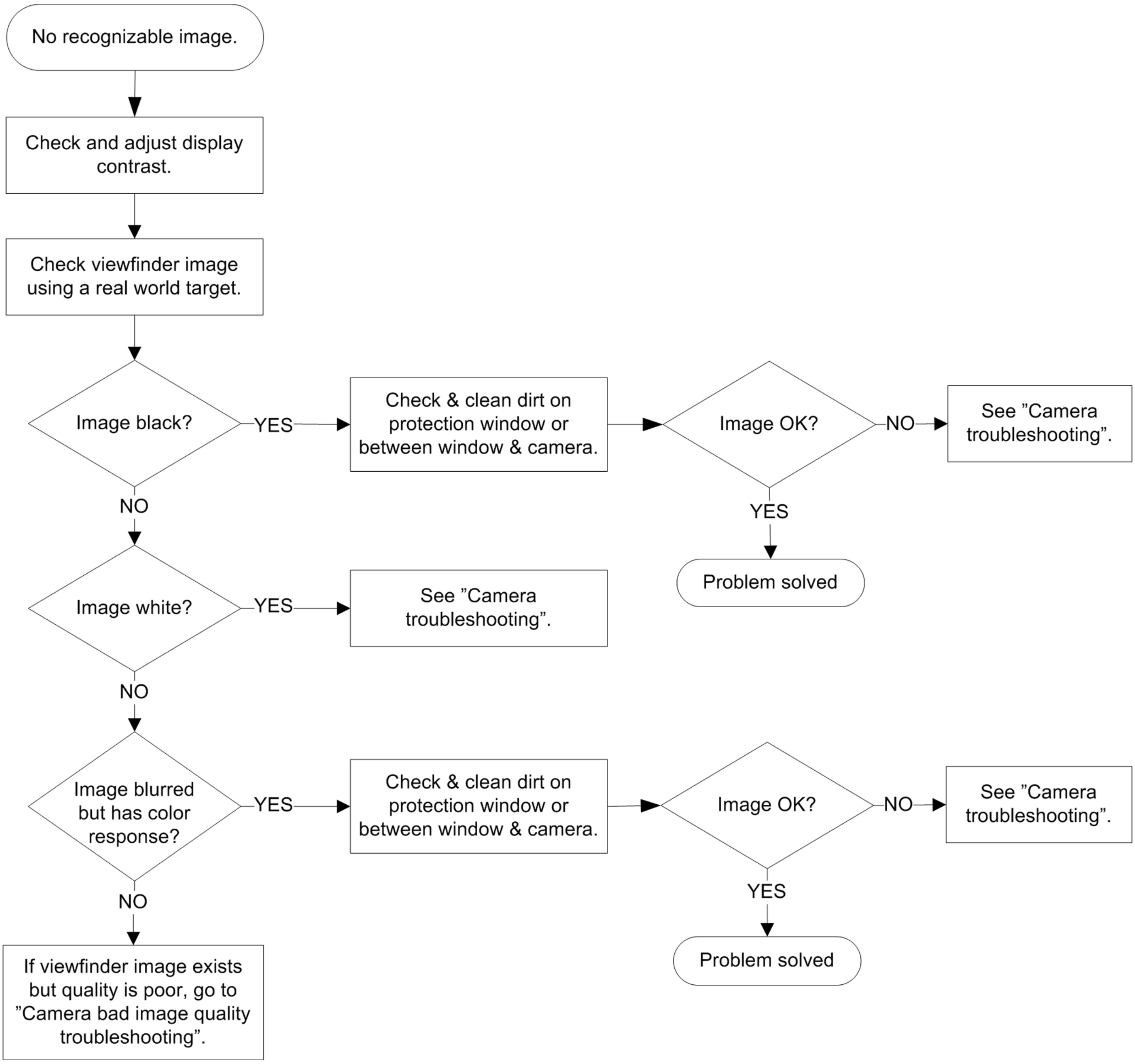
Camera baseband troubleshooting

Troubleshooting flow


From "Camera troubleshooting"
Check powerings. OK now?
Reboot phone, start the camera application. Is camera working?
YES
NO
Check I2C traffic from R2852 and R2853. Tr, Tf < 300ns. Levels 1.8V and Ext CLK = 9.6MHz from R1405 to GND. Vamplitude 1.8V?
YES
Start camera application and check VDIG 1V8 (N1420) at C1402 or C1405. Check VANA 2V8 (N1421) at C1404 or C1400. Check VBAT at C1401. Are the voltages OK?
YES
NO
NO
Check L1420, L1421, N1420, N1421, R1402. Replace if not OK.
Engine is defect. Replace engine/main PWB
Check R2852, R2853 and R1405. Replace if needed. Is I2C and Clk OK now?
YES
NO
Is camera OK now?
NO
Engine is defect. Replace engine/main PWB
YES
END

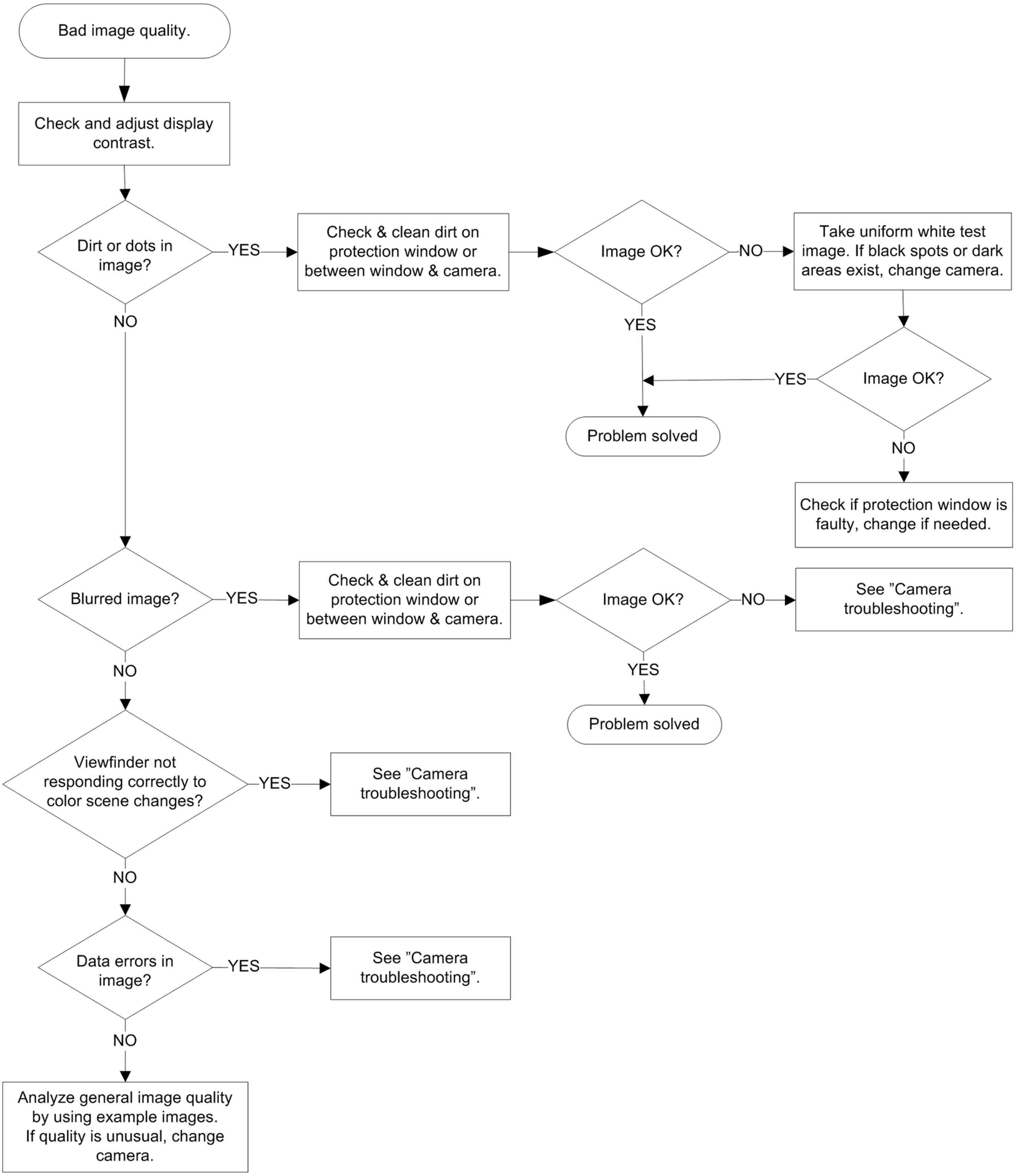
Camera no recognizable viewfinder image troubleshooting

Troubleshooting flow


No recognizable image.
Check and adjust display contrast.
Check viewfinder image using a real world target.
Image black?
YES
Check & clean dirt on protection window or between window & camera.
Image OK?
NO
See ”Camera troubleshooting”.
YES
Problem solved
NO
Image white?
YES
See ”Camera troubleshooting”.
NO
Image blurred but has color response?
YES
Check & clean dirt on protection window or between window & camera.
Image OK?
NO
See ”Camera troubleshooting”.
YES
Problem solved
NO
If viewfinder image exists but quality is poor, go to ”Camera bad image quality troubleshooting”.

Camera bad image quality troubleshooting

Troubleshooting flow

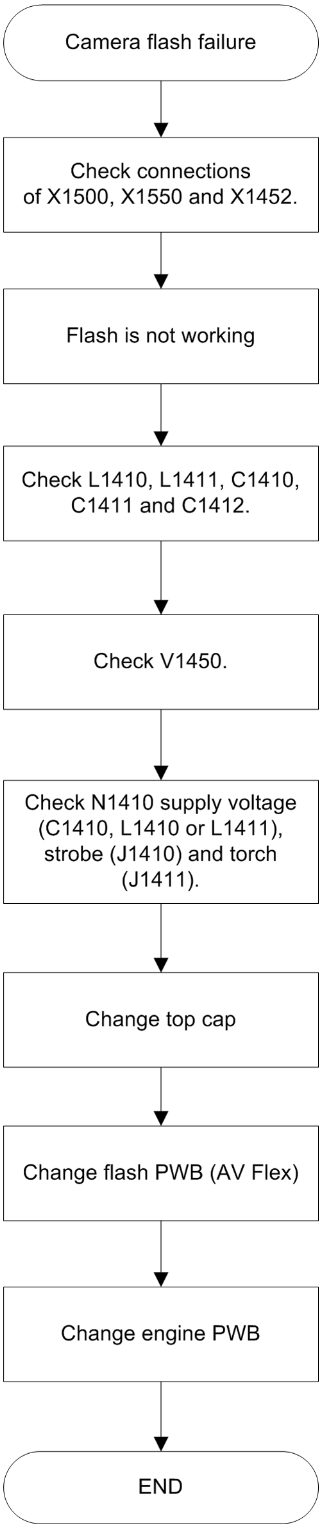

Bad image quality.
Check and adjust display contrast.
Dirt or dots in image?
YES
Check & clean dirt on protection window or between window & camera.
Image OK?
NO
Take uniform white test image. If black spots or dark areas exist, change camera.
YES
Image OK?
YES
Problem solved
NO
Check if protection window is faulty, change if needed.
NO
Blurred image?
YES
Check & clean dirt on protection window or between window & camera.
Image OK?
NO
See ”Camera troubleshooting”.
YES
Problem solved
NO
Viewfinder not responding correctly to color scene changes?
YES
See ”Camera troubleshooting”.
NO
Data errors in image?
YES
See ”Camera troubleshooting”.
NO
Analyze general image quality by using example images. If quality is unusual, change camera.

Camera flash troubleshooting

Context

Note: Before checking flash functionality, make sure that the camera is working ok.

Troubleshooting flow


Camera flash failure
Check connections of X1500, X1550 and X1452.
Flash is not working
Check L1410, L1411, C1410, C1411 and C1412.
Check V1450.
Check N1410 supply voltage (C1410, L1410 or L1411), strobe (J1410) and torch (J1411).
Change top cap
Change flash PWB (AV Flex)
Change engine PWB
END

Audio troubleshooting

Audio troubleshooting test instructions

Differential external earpiece and internal earpiece outputs can be measured either with a single-ended or a differential probe.

When measuring with a single-ended probe each output is measured against the ground.

Internal handsfree output is measured using a current probe, if a special low-pass filter designed for measuring a digital amplifier is not available. Note also that when using a current probe, the input signal frequency must be set to 2kHz.

The input signal for each loop test can be either single-ended or differential.

Required equipment

The following equipment is needed for the tests:

- Oscilloscope
- Function generator (sine waveform)
- Phoenix service software
- Battery voltage 3.7V

Test procedure

Audio can be tested using the Phoenix audio routings option. These different audio loop paths can be activated:

- Mic2P to Internal earpiece
- Mic2P microphone to Internal handsfree speaker

Each audio loop sets routing from the specified input to the specified output enabling a quick in-out test. Loop path gains are fixed and they cannot be changed using Phoenix. Correct pins and signals for each test are presented in a table in the following section.

Phoenix audio loop tests and test results

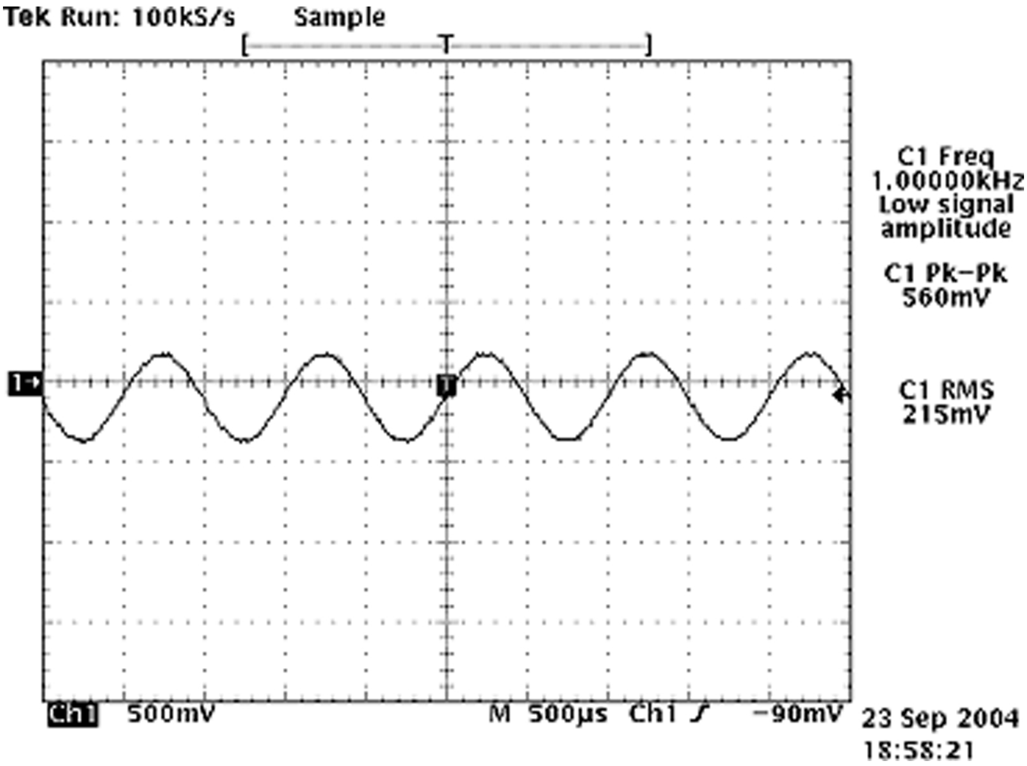
The results presented in this table apply when no accessory is connected and battery voltage is set to 3.7V.

Earpiece, internal microphone and speaker are in place during measurement. Applying a headset accessory during measurement causes a significant drop in measured quantities.

The gain values presented in the table apply for a differential output vs. single-ended/differential input.

Loop test	Input terminal	Output terminal	Path gain [dB] (fixed)	Input voltage [mVp-p]	Differential output voltage [mVp-p]	Output DC level [V]	Output current [mA]
External Mic to Internal Earpiece	testpad J2101	EarP and EarN	~9	100	288	NA	NA
External Mic to Internal handsfree	testpad J2101	B2170 pads	~16	100	600	NA	NA

Measurement data

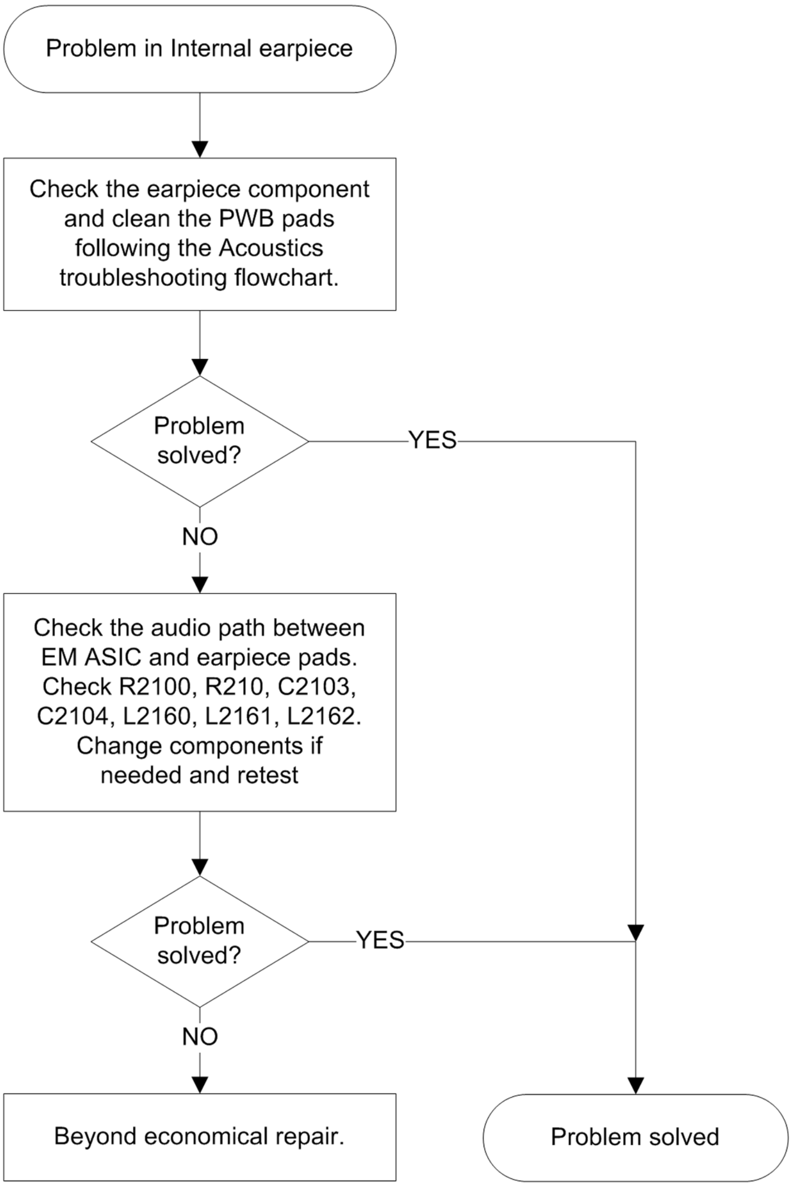


If a special low-pass filter designed for measuring digital amplifiers is unavailable, the measurement must be performed with a current probe and the input signal frequency must be 2kHz.

Figure 19 Differential output waveform of the Ext_in_IHF_out out loop measurement when speaker is connected.

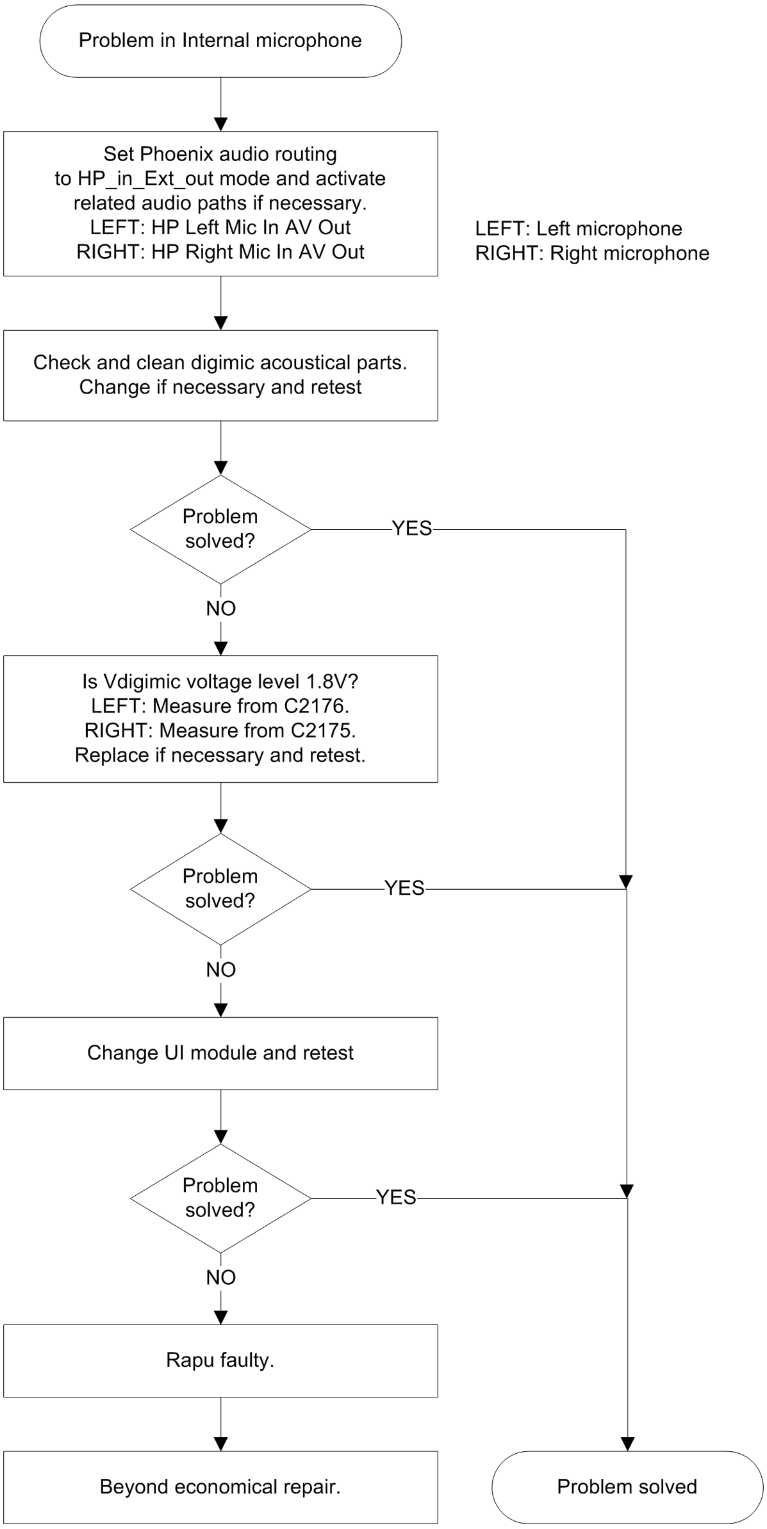
Internal earpiece troubleshooting

Troubleshooting flow


Problem in Internal earpiece
Check the earpiece component and clean the PWB pads following the Acoustics troubleshooting flowchart.
Problem solved?
YES
NO
Check the audio path between EM ASIC and earpiece pads. Check R2100, R210, C2103, C2104, L2160, L2161, L2162. Change components if needed and retest
Problem solved?
YES
NO
Beyond economical repair.
Problem solved

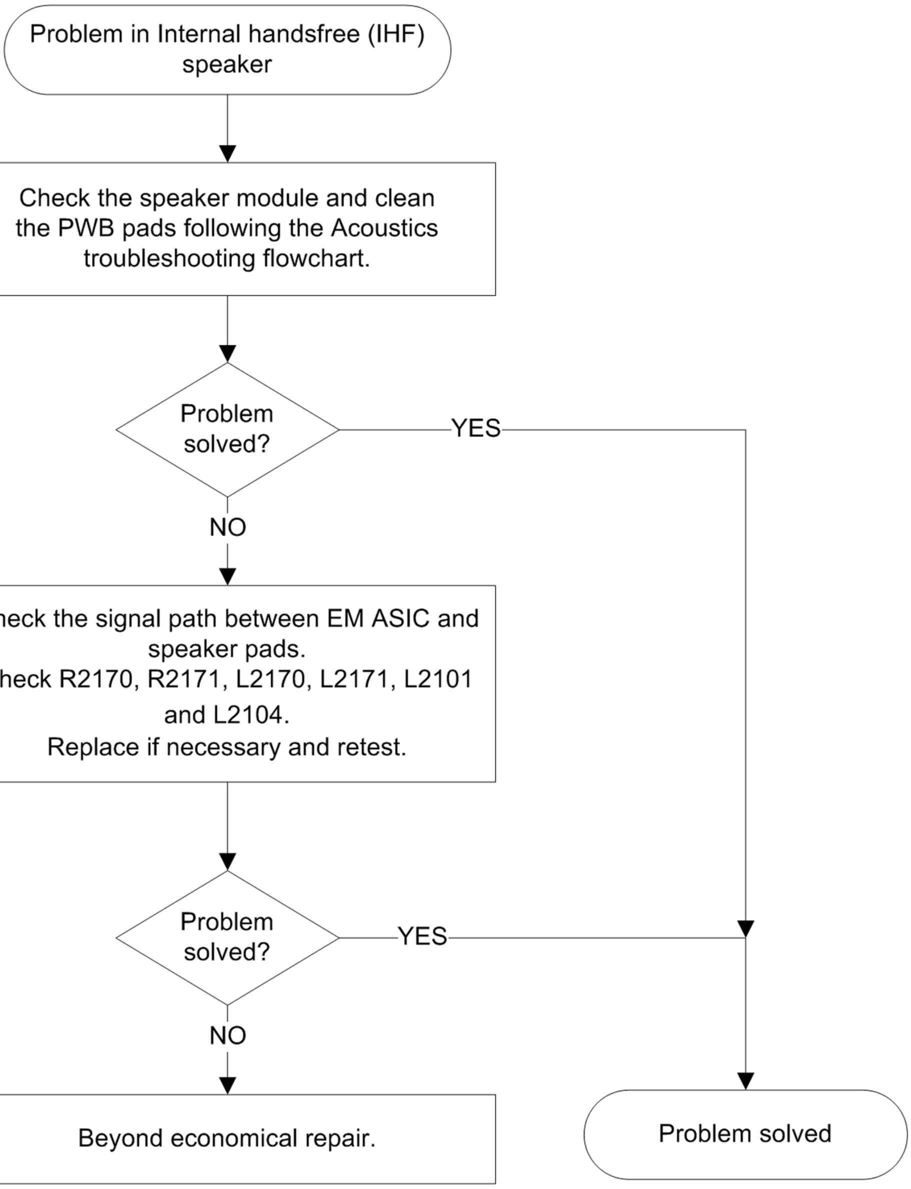
Internal microphone troubleshooting

Troubleshooting flow


Problem in Internal microphone
Set Phoenix audio routing to HP_in_Ext_out mode and activate related audio paths if necessary. LEFT: HP Left Mic In AV Out RIGHT: HP Right Mic In AV Out
LEFT: Left microphone
RIGHT: Right microphone
Check and clean digimic acoustical parts. Change if necessary and retest
Problem solved?
YES
NO
Is Vdigimic voltage level 1.8V? LEFT: Measure from C2176. RIGHT: Measure from C2175. Replace if necessary and retest.
Problem solved?
YES
NO
Change UI module and retest
Problem solved?
YES
NO
Rapu faulty.
Beyond economical repair.
Problem solved

Internal handsfree (IHF) troubleshooting

Troubleshooting flow


Problem in Internal handsfree (IHF) speaker
Check the speaker module and clean the PWB pads following the Acoustics troubleshooting flowchart.
Problem solved?
YES
NO
Check the signal path between EM ASIC and speaker pads.
Check R2170, R2171, L2170, L2171, L2101 and L2104.
Replace if necessary and retest.
Problem solved?
YES
NO
Beyond economical repair.
Problem solved

Acoustics troubleshooting

Introduction to acoustics troubleshooting

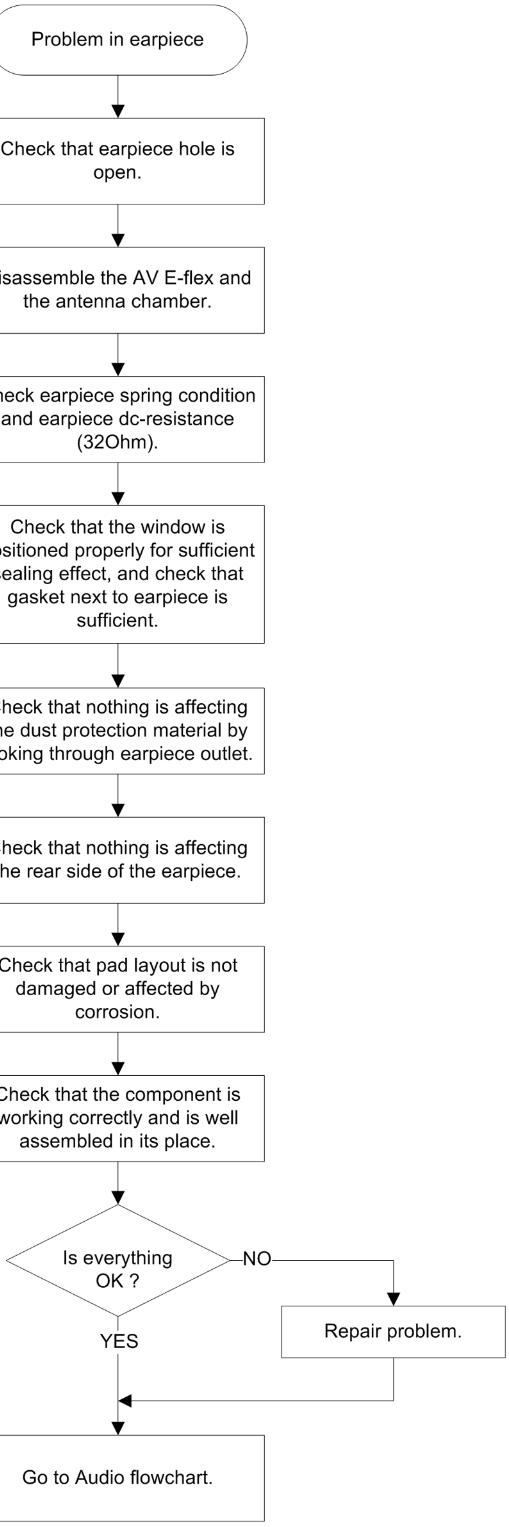
Acoustics design ensures that the sound is detected correctly with a microphone and properly radiated to the outside of the device by the speaker. The acoustics of the phone include three basic systems: earpiece, integrated handsfree (IHF) and dual microphone (for noise cancelling).

The sound reproduced from the earpiece eradiates through a single hole on the front cover (A-cover). The sound reproduced from the IHF speaker radiates from the sound hole located on the back side on the top part of the phone. The inlets for the 2 microphones are found in the bottom and next to the capture key, respectively.

For a correct functionality of the phone, all sound holes must be always open. When the phone is used, care must be taken not to close any of those holes with a hand or fingers. The phone should be dry and clean, and no objects must be located in such a way that they close any of the holes.

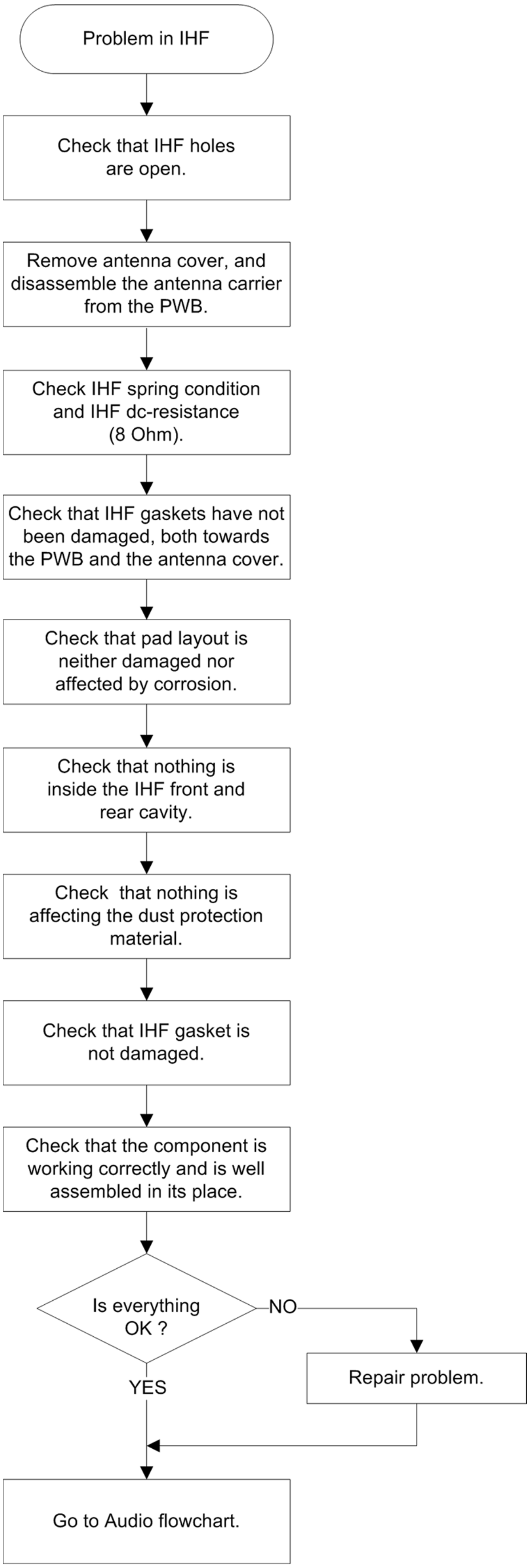
Earpiece troubleshooting

Troubleshooting flow


Problem in earpiece
Check that earpiece hole is open.
Disassemble the AV E-flex and the antenna chamber.
Check earpiece spring condition and earpiece dc-resistance (32Ohm).
Check that the window is positioned properly for sufficient sealing effect, and check that gasket next to earpiece is sufficient.
Check that nothing is affecting the dust protection material by looking through earpiece outlet.
Check that nothing is affecting the rear side of the earpiece.
Check that pad layout is not damaged or affected by corrosion.
Check that the component is working correctly and is well assembled in its place.
Is everything OK ?
NO
Repair problem.
YES
Go to Audio flowchart.

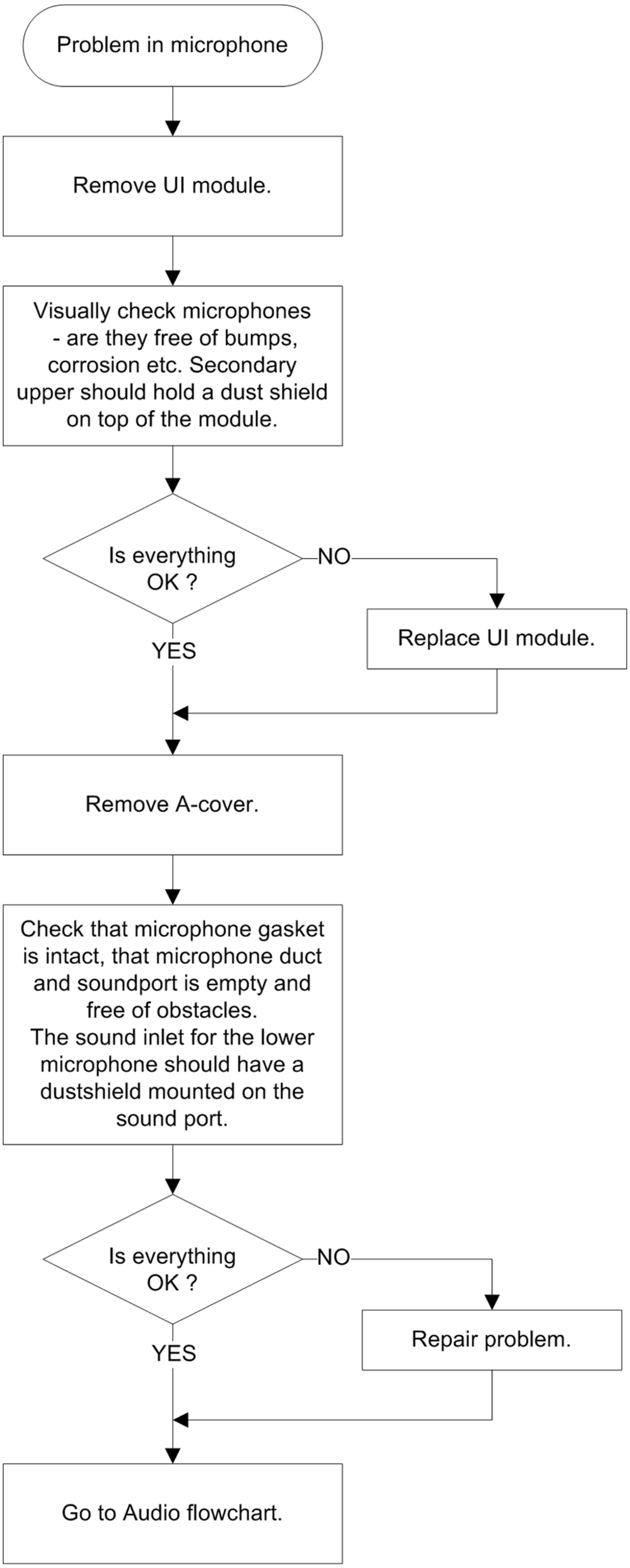
IHF troubleshooting

Troubleshooting flow


Problem in IHF
Check that IHF holes are open.
Remove antenna cover, and disassemble the antenna carrier from the PWB.
Check IHF spring condition and IHF dc-resistance (8 Ohm).
Check that IHF gaskets have not been damaged, both towards the PWB and the antenna cover.
Check that pad layout is neither damaged nor affected by corrosion.
Check that nothing is inside the IHF front and rear cavity.
Check that nothing is affecting the dust protection material.
Check that IHF gasket is not damaged.
Check that the component is working correctly and is well assembled in its place.
Is everything OK ?
NO
Repair problem.
YES
Go to Audio flowchart.

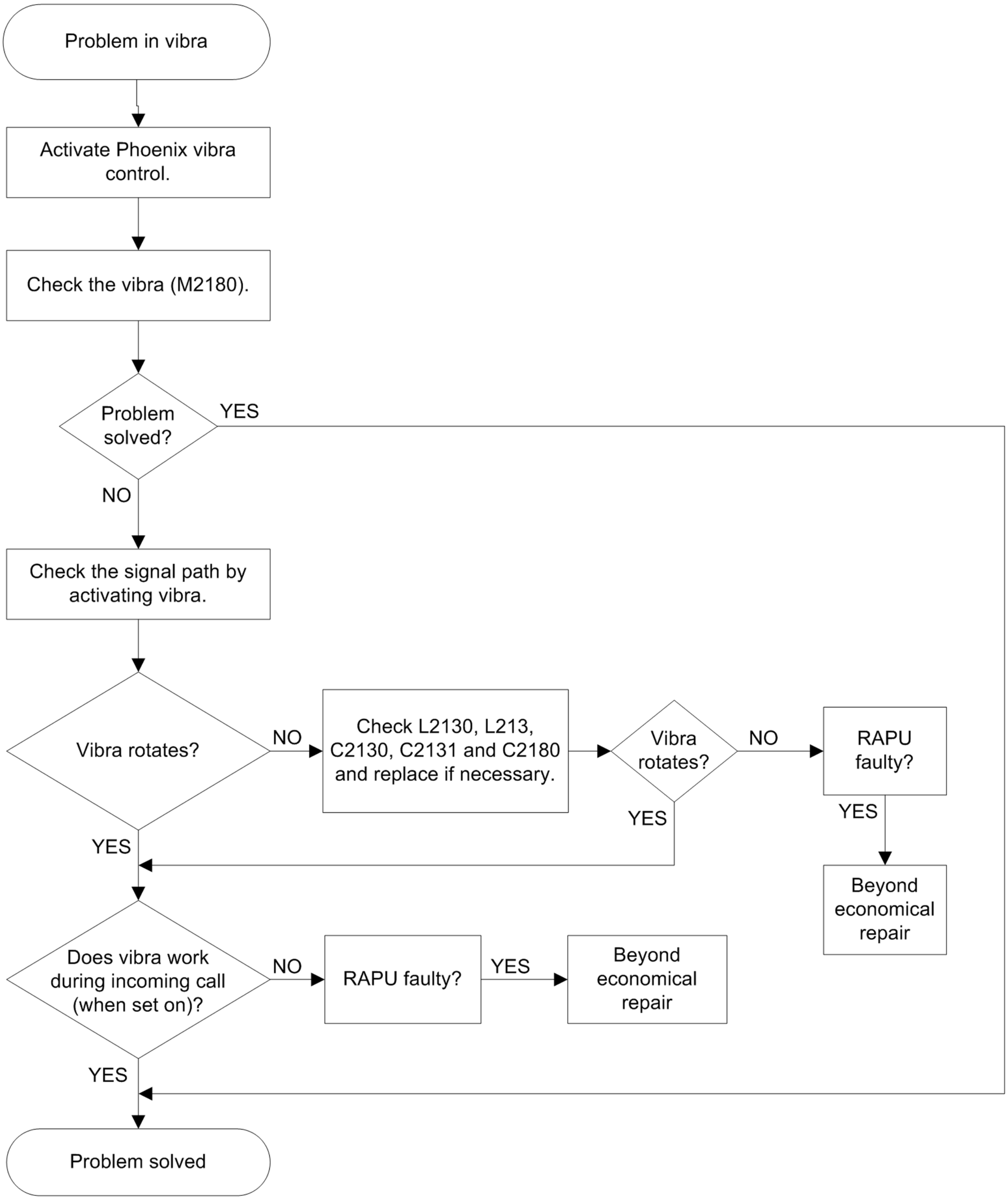
Microphone troubleshooting

Troubleshooting flow


Problem in microphone
Remove UI module.
Visually check microphones - are they free of bumps, corrosion etc. Secondary upper should hold a dust shield on top of the module.
Is everything OK ?
NO
Replace UI module.
YES
Remove A-cover.
Check that microphone gasket is intact, that microphone duct and soundport is empty and free of obstacles.
The sound inlet for the lower microphone should have a dustshield mounted on the sound port.
Is everything OK ?
NO
Repair problem.
YES
Go to Audio flowchart.

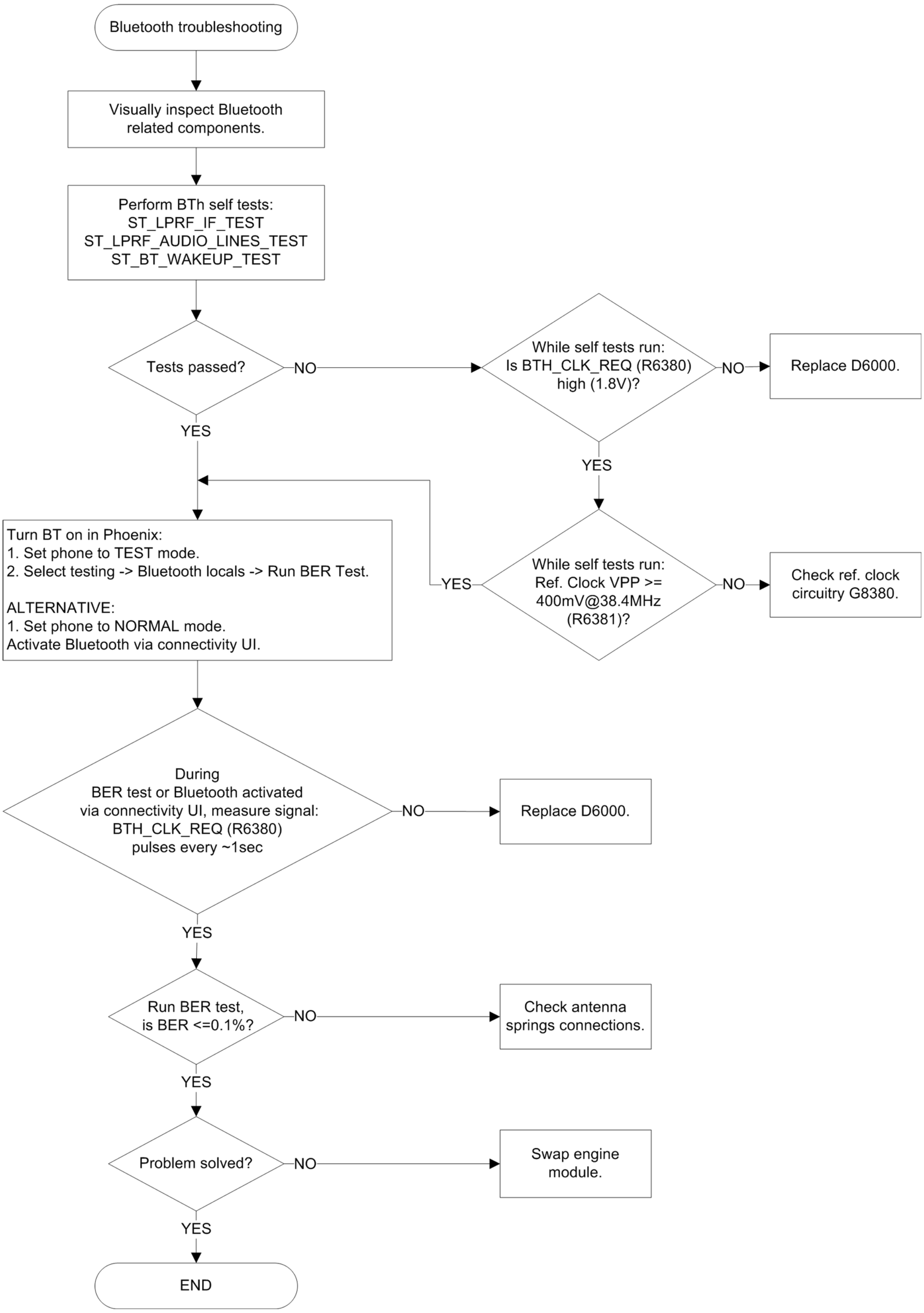
Vibra troubleshooting

Troubleshooting flow


Problem in vibra
Activate Phoenix vibra control.
Check the vibra (M2180).
Problem solved?
YES
NO
Check the signal path by activating vibra.
Vibra rotates?
NO
Check L2130, L213, C2130, C2131 and C2180 and replace if necessary.
Vibra rotates?
NO
RAPU faulty?
YES
Beyond economical repair
YES
YES
Does vibra work during incoming call (when set on)?
NO
RAPU faulty?
YES
Beyond economical repair
YES
Problem solved

Bluetooth troubleshooting

Troubleshooting flow


Bluetooth troubleshooting
Visually inspect Bluetooth related components.
Perform BTh self tests: ST_LPRF_IF_TEST ST_LPRF_AUDIO_LINES_TEST ST_BT_WAKEUP_TEST
Tests passed?
NO
YES
While self tests run: Is BTH_CLK_REQ (R6380) high (1.8V)?
NO
Replace D6000.
YES
Turn BT on in Phoenix:
1. Set phone to TEST mode.
2. Select testing -> Bluetooth locals -> Run BER Test.
ALTERNATIVE:
1. Set phone to NORMAL mode.
Activate Bluetooth via connectivity UI.
YES
While self tests run: Ref. Clock VPP >= 400mV@38.4MHz (R6381)?
NO
Check ref. clock circuitry G8380.
During BER test or Bluetooth activated via connectivity UI, measure signal: BTH_CLK_REQ (R6380) pulses every ~1sec
NO
Replace D6000.
YES
Run BER test, is BER <=0.1%?
NO
Check antenna springs connections.
YES
Problem solved?
NO
Swap engine module.
YES
END

Baseband manual tuning guide

Certificate restoring for BB5 products

Context

This procedure is performed when the device certificate is corrupted for some reason.

All tunings (RF & Baseband, UI) must be done after performing the certificate restoring procedure.

The procedure for certificate restoring is the following:

- Flash the phone with the latest available software using FPS-20 or FPS-21.

  Note: USB flashing does not work for a dead BB5 phone.
- Create a request file.
- Send the file to Nokia by e-mail. Use the following addresses depending on your location:
  - APAC: sydney.service@nokia.com
  - CHINA: repair.ams@nokia.com
  - E&A: salo.repair@nokia.com
  - AMERICAS: fls1.usa@nokia.com
- When you receive a reply from Nokia, carry out certificate restoring.
- Tune the phone completely.

  Note: SX-4 smart card is needed.
- If the phone resets after certificate restoring, reflash the phone again.

Required equipment and setup:

- *Phoenix* service software v 2008.34/38 or newer.
- The latest phone model specific *Phoenix* data package.
- PKD-1 dongle
- SX-4 smart card (Enables BB5 testing and tuning features)
- Activated FPS-20 flash prommer **OR** FPS-21 flash prommer
- Flash update package 08.30.012 or newer for FPS-20 or FPS-21 flash prommers
- CU-4 control unit
- USB cable from PC USB Port to CU-4 control unit
- Phone model specific adapter for CU-4 control unit
- PCS-1 cable to power CU-4 from external power supply
- XCS-4 modular cable between flash prommer and CU-4

  Note: CU-4 must be supplied with +12 V from an external power supply in all steps of certificate restoring.

Steps

1. Program the phone software.

   i Start *Phoenix* and login. Make sure the connection has been managed correctly for FPS-20 or FPS-21.

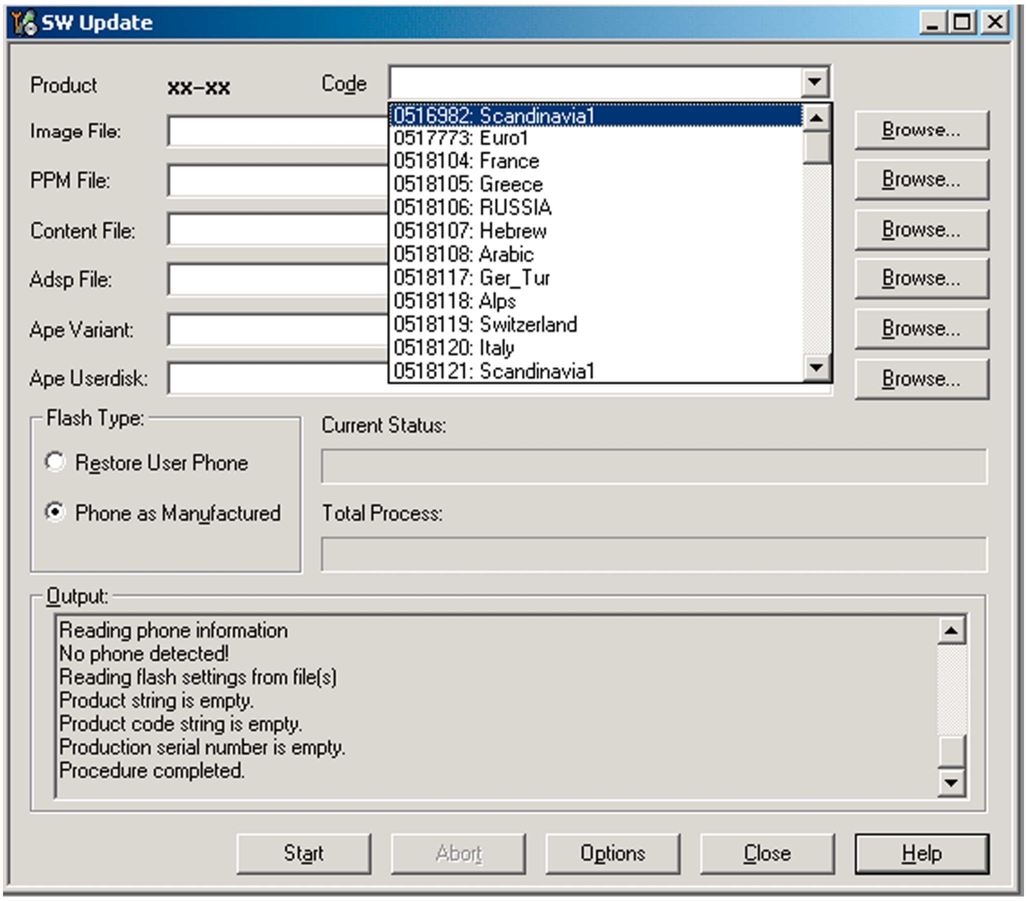
   ii Update the phone MCU software to the latest available version.

   If the new flash is empty and the phone cannot communicate with *Phoenix*, reflash the phone.

iii Choose the product manually from **File→Open Product** , and click **OK**.

Wait for the phone type designator (e.g. "RM-1") to be displayed in the status bar.

iv Go to **Flashing→SW Update** and wait until *Phoenix* reads the product data as shown in the following picture.


SW Update
Product
Code
Image File:
PPM File:
Content File:
Adsp File:
Ape Variant:
Ape Userdisk:
Browse...
Browse...
Browse...
Browse...
Browse...
Browse...
Flash Type:
Current Status:
Total Process:
Output:
Start
Abort
Options
Close
Help

Product: xx-xx

Code:
0516982: Scandinavia1
0517773: Euro1
0518104: France
0518105: Greece
0518106: RUSSIA
0518107: Hebrew
0518108: Arabic
0518117: Ger_Tur
0518118: Alps
0518119: Switzerland
0518120: Italy
0518121: Scandinavia1

Flash Type:
○ Restore User Phone
● Phone as Manufactured

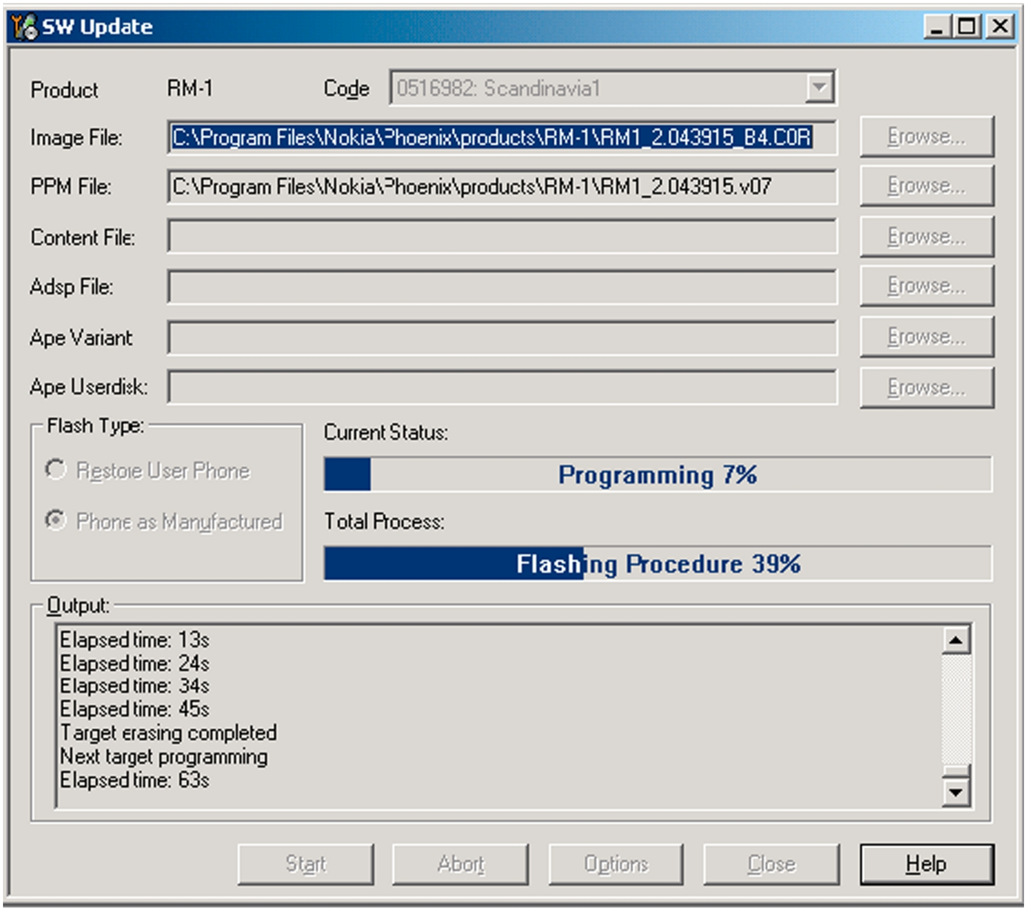
Output:

```
Reading phone information
No phone detected!
Reading flash settings from file(s)
Product string is empty.
Product code string is empty.
Production serial number is empty.
Procedure completed.
```

Product	is automatically set according to the phone support module which was opened manually, but the flash files cannot be found because the correct data cannot be read from the phone automatically.
Code	must be chosen manually, it determines the correct flash files to be used. Please choose the correct product code (can be seen in the phone type label) from the dropdown list.
Flash Type	must be set to **Phone as Manufactured**.

v To continue, click **Start**.

Progress bars and messages on the screen show actions during phone programming, please wait.



SW Update

Product: RM-1
Code: 0516982: Scandinavia1
Image File: C:\Program Files\Nokia\Phoenix\products\RM-1\RM1_2.043915_B4.C0R
PPM File: C:\Program Files\Nokia\Phoenix\products\RM-1\RM1_2.043915.v07
Content File:
Adsp File:
Ape Variant
Ape Userdisk:

Flash Type:
○ Restore User Phone
● Phone as Manufactured

Current Status: Programming 7%
Total Process: Flashing Procedure 39%

Output:

```
Elapsed time: 13s
Elapsed time: 24s
Elapsed time: 34s
Elapsed time: 45s
Target erasing completed
Next target programming
Elapsed time: 63s
```

Programming is completed when Flashing Completed message is displayed.

The product type designator and MCU SW version are displayed in the status bar.

vi Close the *SW Update* window and then choose **File→Close Product** .

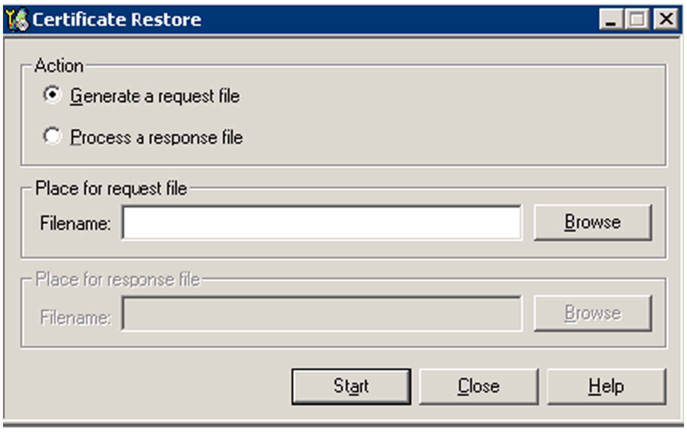
2. Create a *Request* file.

   For this procedure, you must supply +12 V to CU-4 from an external power supply.

   i To connect the phone with *Phoenix*, choose **File→Scan Product** .

   ii Choose **Tools→Certificate Restore** .

   iii To choose a location for the request file, click **Browse**.



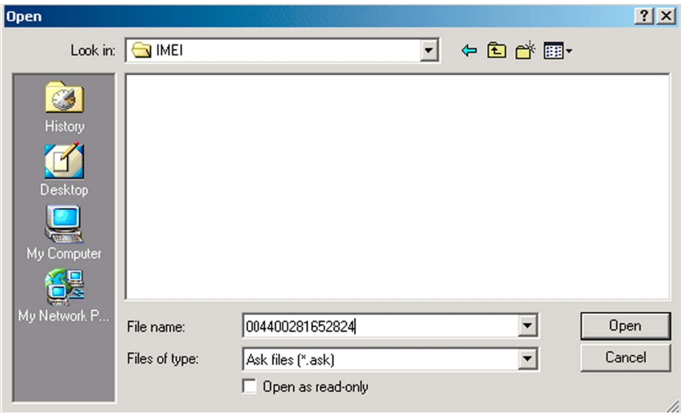
Certificate Restore

Action
● Generate a request file
○ Process a response file

Place for request file
Filename:

Place for response file
Filename:

iv Name the file so that you can easily identify it, and click **Open**.

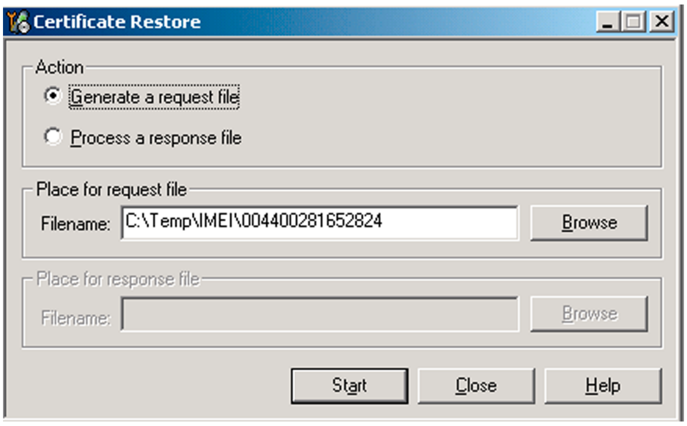

Open
Look in: IMEI
History
Desktop
My Computer
My Network P...
Open
Cancel

File name: 004400281652824

Files of type: Ask files (*.ask)

☐ Open as read-only

The name of the file and its location are shown.


Certificate Restore
Action
Place for request file
Place for response file
Browse
Browse
Start
Close
Help

● Generate a request file

○ Process a response file

Filename: C:\Temp\IMEI\004400281652824

Filename:

v To create the *Request* file, click **Start**.

vi When the file for certificate restore has been created, send it to Nokia as an e-mail attachment.

3. Restore certificate.

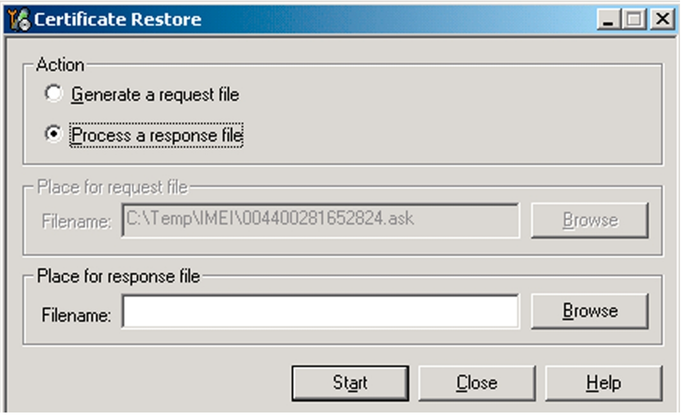
For this procedure, you must supply +12 V to CU-4 from an external power supply.

i Save the reply file sent by Nokia to your computer.

ii Start *Phoenix* service software.

iii Choose **File→Scan Product** .

iv From the **Tools** menu, choose **Certificate Restore** and select **Process a response file** in the *Action* pane.



Certificate Restore

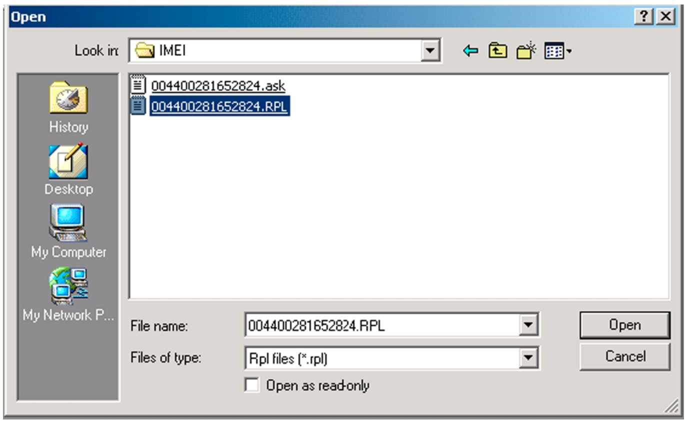
Action
○ Generate a request file
● Process a response file

Place for request file
Filename: C:\Temp\IMEI\004400281652824.ask

Place for response file
Filename:

v To choose the location where response file is saved, click **Browse**.

vi Click **Open**.



Open

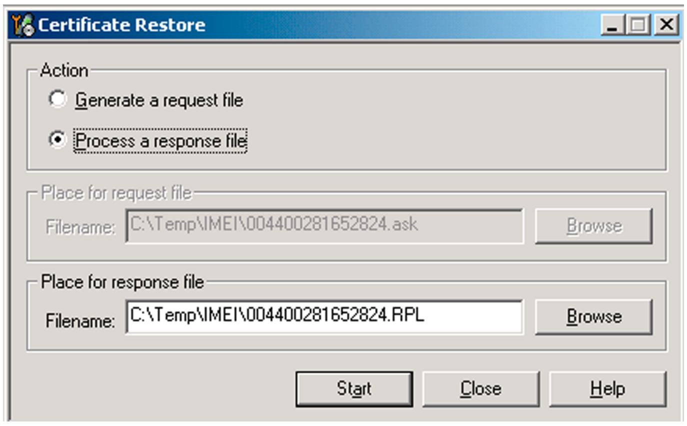
Look in: IMEI

004400281652824.ask
004400281652824.RPL

File name: 004400281652824.RPL
Files of type: Rpl files (*.rpl)
☐ Open as read-only

The name of the file and the path where it is located are shown.

vii To write the file to phone, click **Start**.



Certificate Restore

Action
○ Generate a request file
● Process a response file

Place for request file
Filename: C:\Temp\IMEI\004400281652824.ask

Place for response file
Filename: C:\Temp\IMEI\004400281652824.RPL

Next actions

After a successful rewrite, you must retune the phone completely by using *Phoenix* tuning functions.

Important: Perform all tunings: RF, BB, and UI.

Energy management calibration

Prerequisites

Energy Management (EM) calibration is performed to calibrate the setting (gain and offset) of AD converters in several channels (that is, **battery voltage**, **BSI**, **battery current**) to get an accurate AD conversion result.

Hardware setup:

- An external power supply is needed.
- Supply 12V DC from an external power supply to CU-4 to power up the phone.
- The phone must be connected to a CU-4 control unit with a product-specific flash adapter.

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).
2. Start *Phoenix* service software.
3. Choose **File→ Scan Product.**
4. Choose **Tuning→Energy Management Calibration.**
5. To show the current values in the phone memory, click **Read**, and check that communication between the phone and CU-4 works.
6. Check that the **CU-4 used** check box is checked.
7. Select the item(s) to be calibrated.

   Note: ADC calibration has to be performed before other item(s). However, if all calibrations are selected at the same time, there is no need to perform the ADC calibration first.

8. Click **Calibrate**.

   The calibration of the selected item(s) is carried out automatically.

   The candidates for the new calibration values are shown in the *Calculated values* column. If the new calibration values seem to be acceptable (please refer to the following "Calibration value limits" table), click **Write** to store the new calibration values to the phone permanent memory.

Table 10 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-30	+40
ADC Gain	12000	14000
BSI Gain	1100	1350
VBAT Offset	2635	2755
VBAT Gain	14900	15900
VCHAR Gain	N/A	N/A
IBAT (ICal) Gain	7750	12250

9. Click **Read**, and confirm that the new calibration values are stored in the phone memory correctly. If the values are not stored to the phone memory, click **Write** and/or repeat the procedure again.
10. To end the procedure, close the *Energy Management Calibration* window.

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4 — RF troubleshooting

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General RF troubleshooting

Introduction to RF troubleshooting

Most RF semiconductors are static discharge sensitive

ESD protection must be applied during repair (ground straps and ESD soldering irons).

Pre-baking

These parts are moisture sensitive and must be pre-baked prior to soldering:

- VAPAUS RFIC (N7500)
- TX FEM (N7520)
- WCDMA PA (N7540)
- Aura DC/DC converter (N7560)

Discrete components

In addition to the key components, there are a number of discrete components (resistors, inductors and capacitors) for which troubleshooting is done mainly by *visual inspection*.

Capacitors: check for short circuits.

Resistors: check value with an ohm meter.

> **Note:** In-circuit measurements should be evaluated carefully.

Measuring equipment

All measurements should be done using:

- Module jig MJ-204
- Flash adapter FS-98
- Control unit CU-4/Interface adapter SS-46
- An oscilloscope for low frequency and DC measurements. Recommended probe: 10:1, 10MOhm/8pF.
- A radio communication tester including RF generator and spectrum analyser, for example Rohde & Schwarz CMU200. (Alternatively a spectrum analyser and a RF generator can be used. However, some tests in this guide are not possible to perform if this solution is chosen).

> **Note:** A mobile phone WCDMA transmitter should never be tested with full TX power (only if it is possible to perform the measurement in a good RF-shielded room). Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.
>
> **Note:** All measurements with an RF coupler should be performed in an RF-shielded environment because nearby base stations can disturb sensitive receiver measurements. If there is no possibility to use RF shielded environment, testing at frequencies of nearby base stations should be avoided.

Level of repair

The scope of this guideline is to verify functionality of the cellular RF block without removing RF shield.

Instructions for finding the faulty component are provided in some cases, but the whole RF block still needs to be replaced even when a single component is faulty.

RF key components

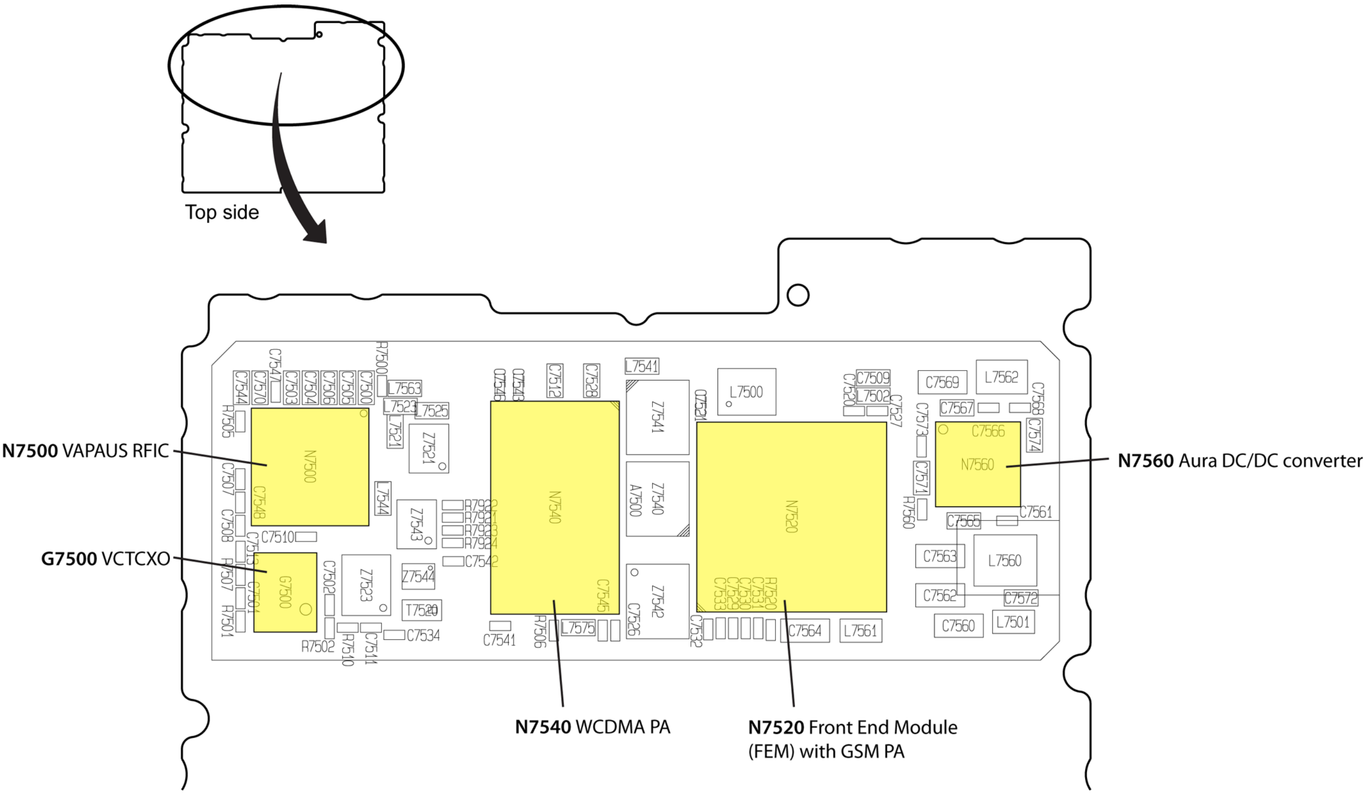

Top side
N7500 VAPAUS RFIC
G7500 VCTCXO
N7560 Aura DC/DC converter
N7540 WCDMA PA
N7520 Front End Module (FEM) with GSM PA
N7500
G7500
N7540
N7520
N7560
L7541
L7500
L7563
L7562
L7560
L7561
L7501
L7575
L7544
Z7541
Z7540
Z7542
Z7543
Z7544
Z7521
Z7523
A7500
T7520
C7509
C7569
C7567
C7566
C7565
C7563
C7562
C7560
C7561
C7564
C7572
C7510
C7534
C7541
C7542
R7502
R7505
R7506
R7507
R7501
R7560

Figure 20 RF key components

Auto tuning

Introduction to auto tuning

This phone can be tuned automatically.

Auto tune is designed to align the phone's RF part easier and faster. It performs calibrations, tunings and measurements of RX and TX. The results are displayed and logged in a result file, if initiated.

Hardware set up

Hardware requirements for auto tuning:

- PC (Windows 2000/XP) with GPIB card
- PK-1/PDK-1 service dongle
- Power supply
- Product specific module jig
- Cables: RF cable XRS-6, USB cable, GBIP cable and MBUS cable DAU-9S
- Signal analyser (TX), signal generator (RX) and RF-splitter or one device including all.

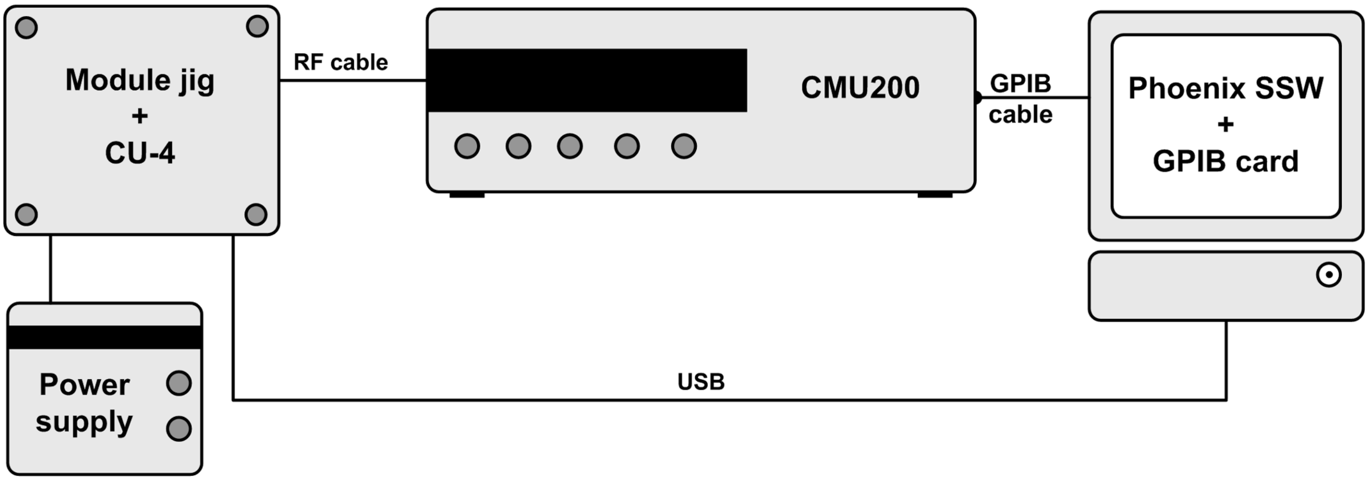


Figure 21 Auto tuning concept with CMU200

Auto tuning procedure

Prerequisites

Install the phone-specific data package, e.g. *Nokia_firmware_RM_470_xxx_v1.00.exe*.

The data package defines the phone-specific settings.

Steps

1. Make sure the phone (in the jig) is connected to the equipment. Else, some menus will not be shown in Phoenix.
2. Go to loss settings by selecting **Tuning (Alt_U)→SET LOSS** from the menu.
3. Set the loss between CMV200 and the phone. (Total loss = cable + jig)
4. Go to auto tuning by selecting **Tuning (Alt_U)→Auto-tune (Alt_A)** from the menu.
5. Start auto tuning by clicking the **Tune** button.

Self test troubleshooting

Phoenix self test troubleshooting

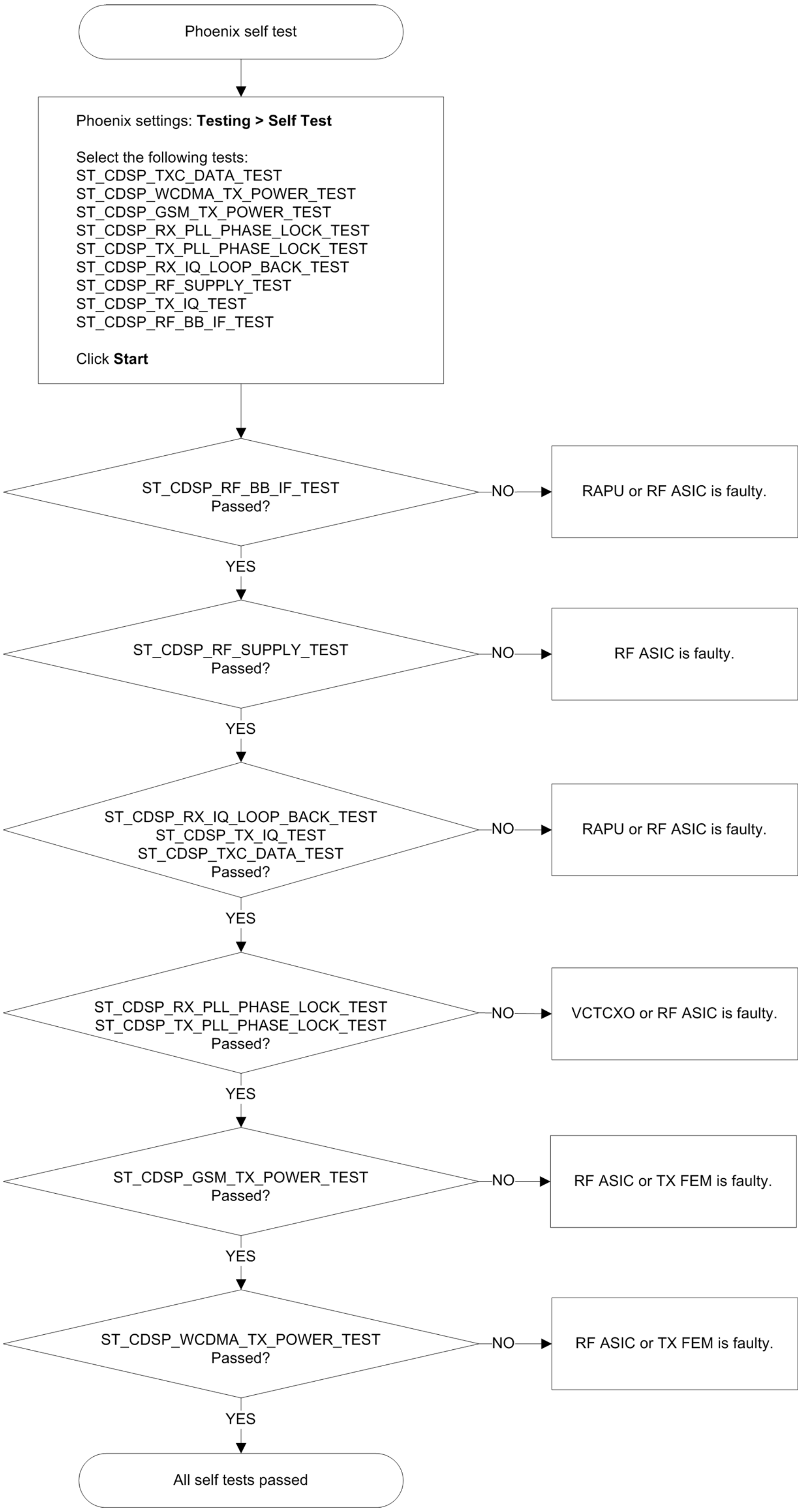
Context

Always start the troubleshooting procedure by running the Phoenix self tests. If a test fails, please follow the diagram below.

If the phone is dead and you cannot perform the self tests, go to Dead or jammed device troubleshooting (page 4–7) in chapter 3, Baseband troubleshooting and manual tuning guide.

> **Note:** Self tests are recommended to be made when phone is in jig and a 50Ω load connected to the RF connector. Otherwise power tests may fail depending on antenna load

Troubleshooting flow


Phoenix self test
Phoenix settings: **Testing > Self Test**
Select the following tests:
ST_CDSP_TXC_DATA_TEST
ST_CDSP_WCDMA_TX_POWER_TEST
ST_CDSP_GSM_TX_POWER_TEST
ST_CDSP_RX_PLL_PHASE_LOCK_TEST
ST_CDSP_TX_PLL_PHASE_LOCK_TEST
ST_CDSP_RX_IQ_LOOP_BACK_TEST
ST_CDSP_RF_SUPPLY_TEST
ST_CDSP_TX_IQ_TEST
ST_CDSP_RF_BB_IF_TEST
Click **Start**
ST_CDSP_RF_BB_IF_TEST Passed?
NO
RAPU or RF ASIC is faulty.
YES
ST_CDSP_RF_SUPPLY_TEST Passed?
NO
RF ASIC is faulty.
YES
ST_CDSP_RX_IQ_LOOP_BACK_TEST ST_CDSP_TX_IQ_TEST ST_CDSP_TXC_DATA_TEST Passed?
NO
RAPU or RF ASIC is faulty.
YES
ST_CDSP_RX_PLL_PHASE_LOCK_TEST ST_CDSP_TX_PLL_PHASE_LOCK_TEST Passed?
NO
VCTCXO or RF ASIC is faulty.
YES
ST_CDSP_GSM_TX_POWER_TEST Passed?
NO
RF ASIC or TX FEM is faulty.
YES
ST_CDSP_WCDMA_TX_POWER_TEST Passed?
NO
RF ASIC or TX FEM is faulty.
YES
All self tests passed

Receiver troubleshooting

Introduction to receiver (RX) troubleshooting

RX can be tested by making a phone call or in local mode. For the local mode testing, use Phoenix service software.

The main RX troubleshooting measurement is RSSI reading. This test measures the signal strength of the received signal. For GSM RSSI measurements, see section GSM RX chain activation for manual measurements/ GSM RSSI measurement (page 4–9) . For a similar test in WCDMA mode, see section WCDMA RSSI measurement (page 4–12).

The RX path for GSM and WCDMA are using the same filters in some bands. Please refer to RM-470 RF components reference (page 4–26) for details.

GSM RX chain activation for manual measurements/GSM RSSI measurement

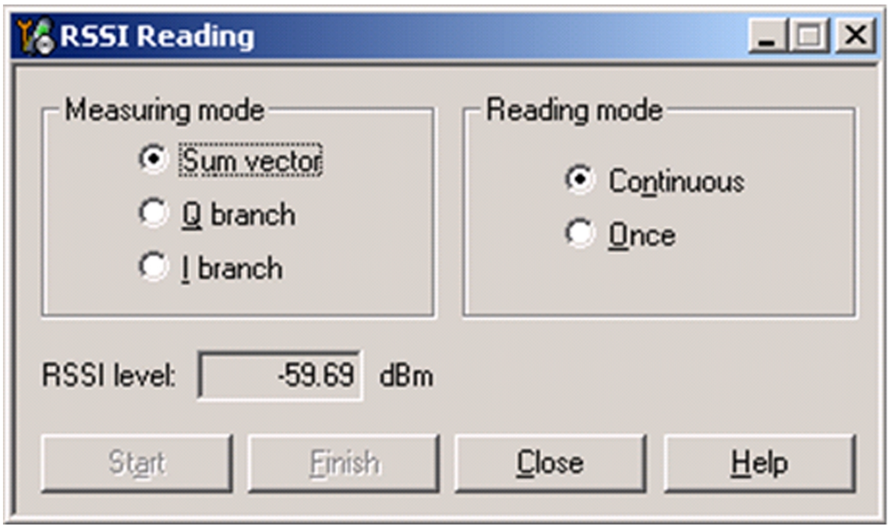
Prerequisites

Make the following settings in signal generator and Phoenix service software:

Setting	GSM850	GSM900	GSM1800	GSM1900
Phoenix Channel	190	37	700	661
Signal generator to antenna connector	881.46771MHz (67.71kHz offset) at -60dBm	942.46771MHz (67.71kHz offset) at -60dBm	1842.86771MHz (67.71kHz offset) at -60dBm	1960.06771MHz (67.71kHz offset) at -60dBm

Steps

1. Set the phone to local mode.
2. Activate RSSI reading in Phoenix by selecting **Testing→GSM→RSSI reading** .



Measuring mode: ● Sum vector ○ Q branch ○ I branch

Reading mode: ● Continuous ○ Once

RSSI level: -59.69 dBm

Figure 22 Phoenix RSSI Reading window

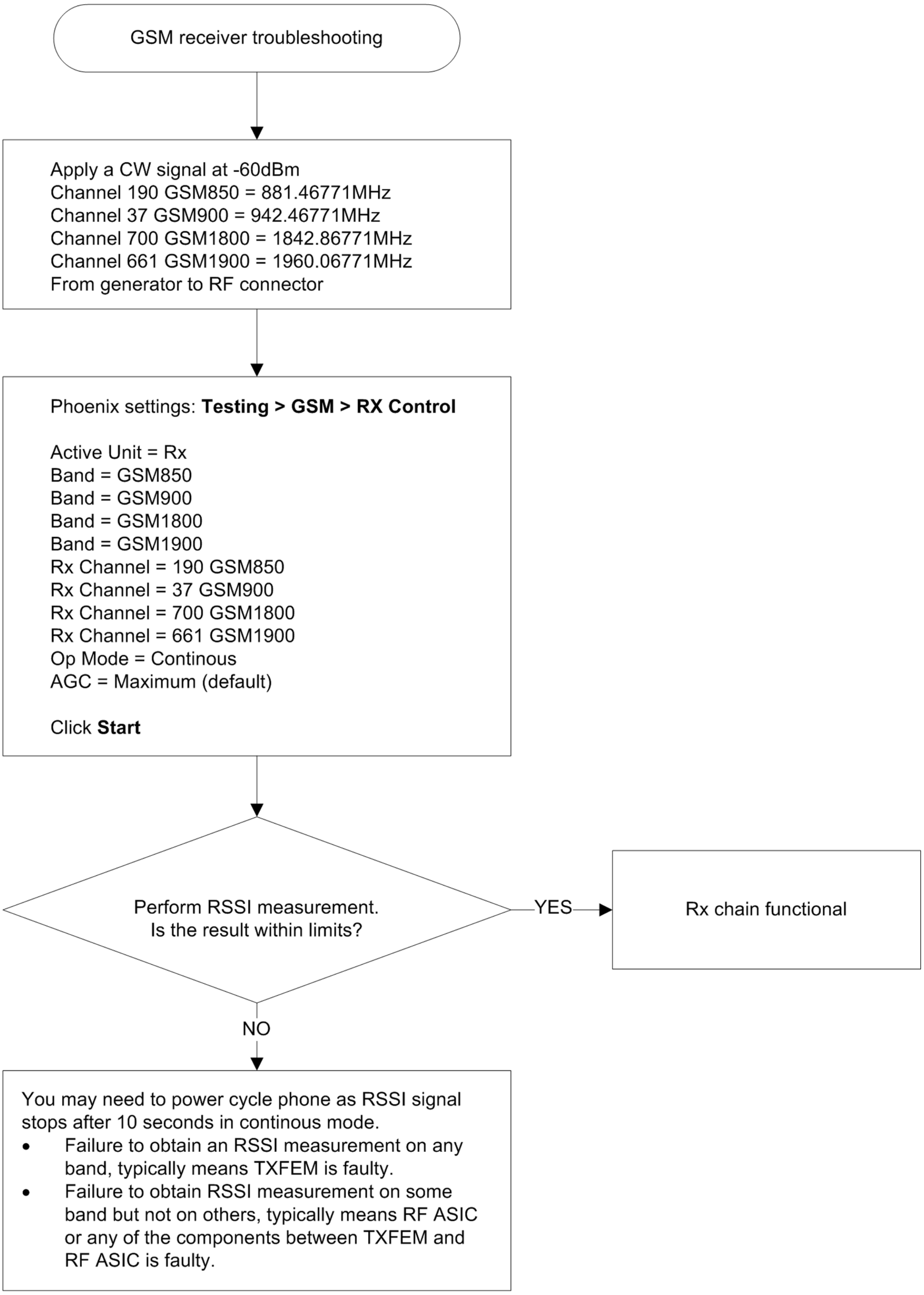
Results

The reading should reflect the level of the signal generator (minus losses) ±5dB.

When varying the level in the range -30 to -102dBm the reading should then follow within ±5dB.

GSM receiver troubleshooting flowchart

Troubleshooting flow



GSM receiver troubleshooting

Apply a CW signal at -60dBm
Channel 190 GSM850 = 881.46771MHz
Channel 37 GSM900 = 942.46771MHz
Channel 700 GSM1800 = 1842.86771MHz
Channel 661 GSM1900 = 1960.06771MHz
From generator to RF connector

Phoenix settings: **Testing > GSM > RX Control**

Active Unit = Rx
Band = GSM850
Band = GSM900
Band = GSM1800
Band = GSM1900
Rx Channel = 190 GSM850
Rx Channel = 37 GSM900
Rx Channel = 700 GSM1800
Rx Channel = 661 GSM1900
Op Mode = Continous
AGC = Maximum (default)

Click **Start**

Perform RSSI measurement.
Is the result within limits?

Rx chain functional

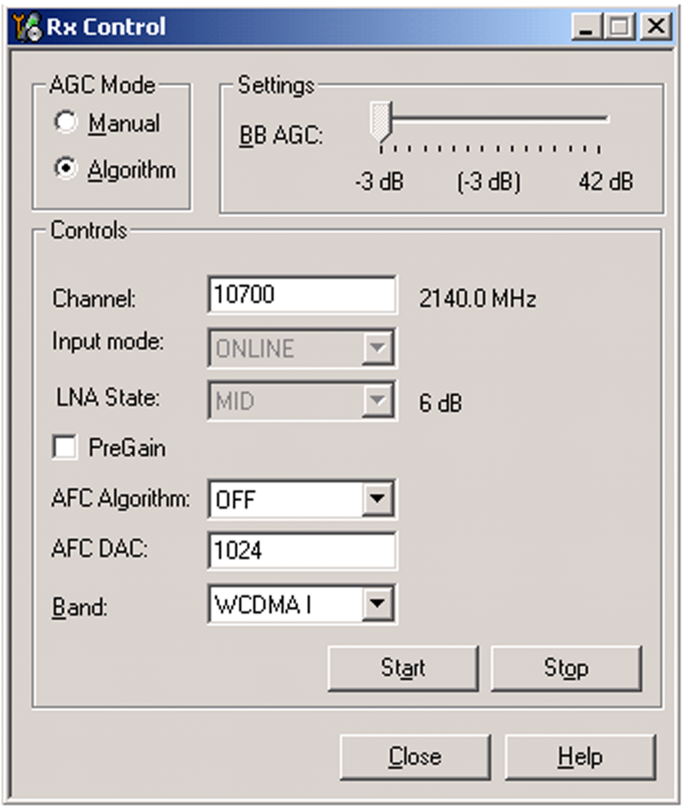
You may need to power cycle phone as RSSI signal stops after 10 seconds in continous mode.

- Failure to obtain an RSSI measurement on any band, typically means TXFEM is faulty.
- Failure to obtain RSSI measurement on some band but not on others, typically means RF ASIC or any of the components between TXFEM and RF ASIC is faulty.

WCDMA RX chain activation for manual measurement

Steps

1. In Phoenix, select **Testing→WCDMA→Rx Control** . The Phoenix Rx Control window opens.



AGC Mode: ○ Manual ● Algorithm

BB AGC: -3 dB (-3 dB) 42 dB

Channel: 10700 2140.0 MHz

Input mode: ONLINE

LNA State: MID 6 dB

☐ PreGain

AFC Algorithm: OFF

AFC DAC: 1024

Band: WCDMA I

Figure 23 Phoenix Rx Control window with sample settings (WCDMA band I)

2. Make settings for the band to be tested according to the following table:

Band to be tested	Phoenix Channel	Signal generator to antenna connector
WCDMA I	10700	2141.0MHz
WCDMA II	9800	1961.0MHz
WCDMA VIII	3013	943.6MHz

3. Make the following general settings (the same values for all bands):

Setting	Value
AGC Mode	Algorithm
AFC Algorithm	OFF
AFC DAC	1024

4. Click **Start** to activate the settings.

   If the settings are changed later on (for example, change of channel) you have to click **Stop** and **Start** again.

Note: Clicking **Stop** also disables TX control if it was active.

WCDMA RSSI measurement

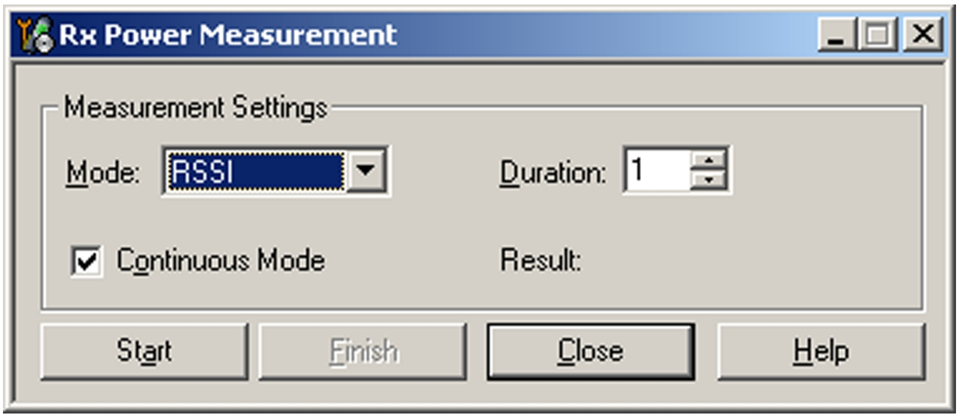
Prerequisites

WCDMA RX must be activated before RSSI can be measured. For instructions, please refer to WCDMA RX chain activation for manual measurement (page 4–11).

Connect signal generator to RF connector and use appropriate frequency for each channel.

Steps

1. In Phoenix select **Testing→WCDMA→RX Power measurement** . The Rx Power Measurement window opens.



Mode: RSSI

Duration: 1

☑ Continuous Mode

Result:

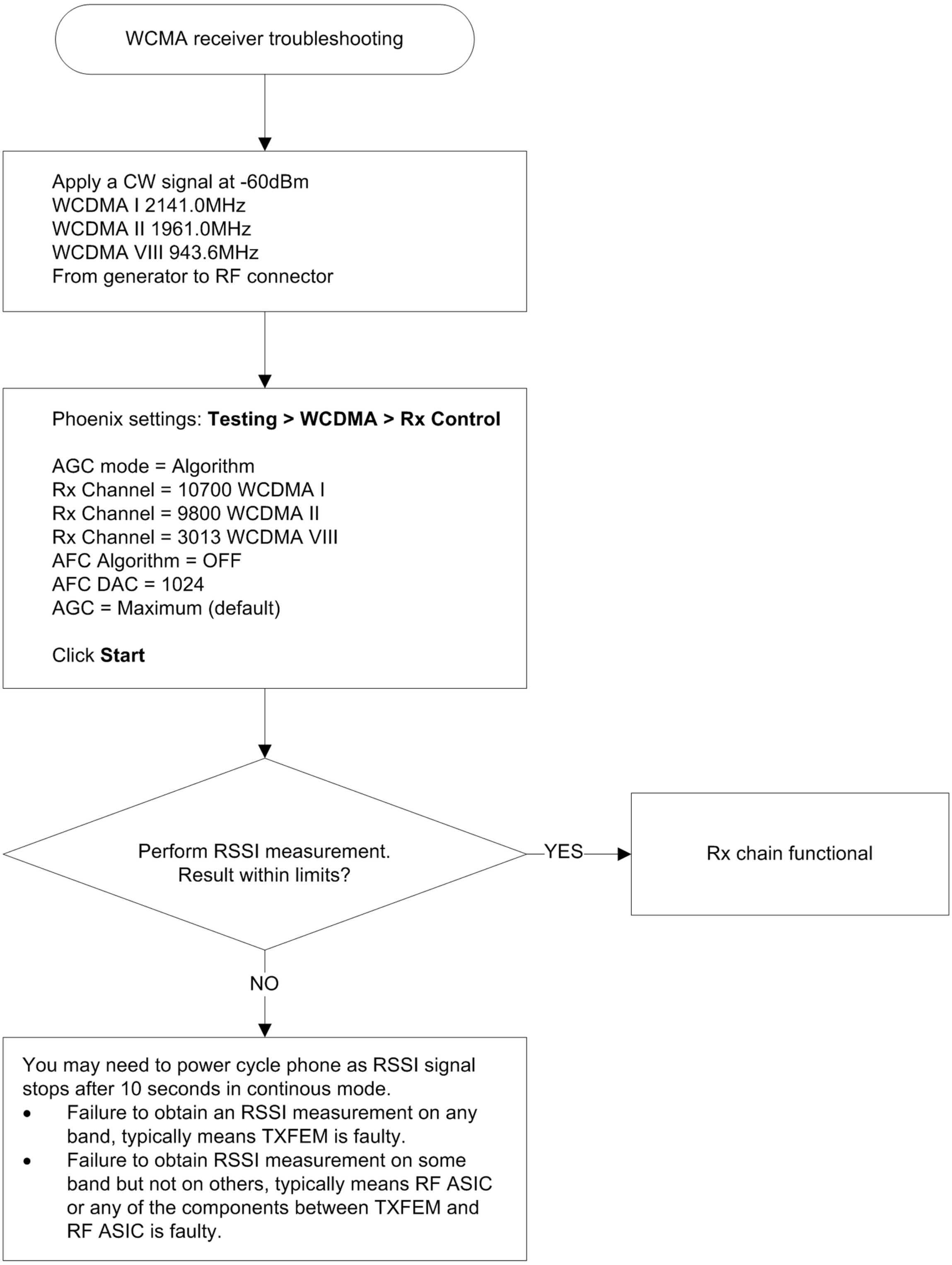
Figure 24 Phoenix Rx Power Measurement window

2. In the RX Power measurement window, select:
   - Mode: RSSI
   - Continuous mode
3. Click **Start** to perform the measurement.

Note: WCDMA RSSI measurement is accurate only with WCDMA modulated signal.

WCDMA receiver troubleshooting flowchart

Troubleshooting flow



WCMA receiver troubleshooting

Apply a CW signal at -60dBm
WCDMA I 2141.0MHz
WCDMA II 1961.0MHz
WCDMA VIII 943.6MHz
From generator to RF connector

Phoenix settings: **Testing > WCDMA > Rx Control**

AGC mode = Algorithm
Rx Channel = 10700 WCDMA I
Rx Channel = 9800 WCDMA II
Rx Channel = 3013 WCDMA VIII
AFC Algorithm = OFF
AFC DAC = 1024
AGC = Maximum (default)

Click **Start**

Perform RSSI measurement.
Result within limits?

Rx chain functional

You may need to power cycle phone as RSSI signal stops after 10 seconds in continous mode.

- Failure to obtain an RSSI measurement on any band, typically means TXFEM is faulty.
- Failure to obtain RSSI measurement on some band but not on others, typically means RF ASIC or any of the components between TXFEM and RF ASIC is faulty.

Transmitter troubleshooting

Introduction to transmitter (TX) troubleshooting

Please note the following before performing transmitter tests:

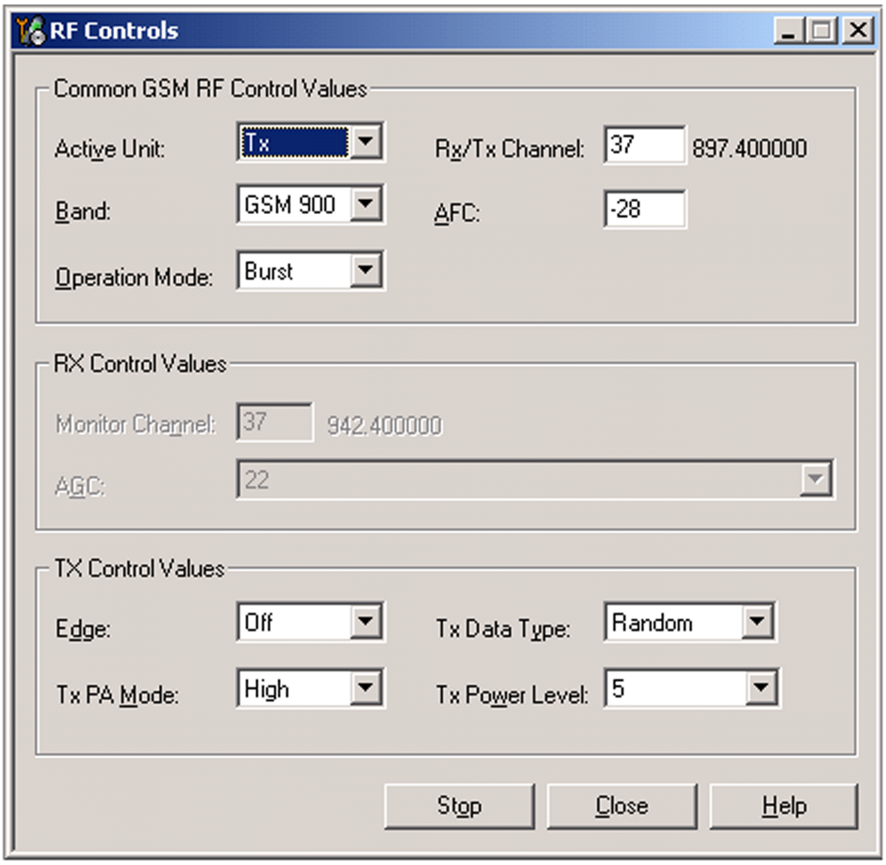
- TX troubleshooting requires TX operation.
- Do not transmit on frequencies that are in use!
- The transmitter can be controlled in local mode for diagnostic purposes.
- The most useful Phoenix tool for GSM transmitter testing is “RF Control”; in WCDMA transmitter testing the best tool is “TX Control”.
- Remember that re-tuning is not a fix! Phones are tuned correctly in production.
- The RX path for GSM and WCDMA are using the same filters in some bands. Please refer to RM-470 RF components reference (page 4–26) for details.

> **Note:** Never activate the GSM or WCDMA transmitter without a proper antenna load. Always connect a 50Ω load to the RF connector (antenna, RF-measurement equipment or at least a 2W dummy load); otherwise the GSM or WCDMA Power amplifier (PA) may be damaged.

GSM transmitter troubleshooting

Steps

1. Set the phone to local mode.
2. In Phoenix, select **Testing→GSM→Rf Controls** . The RF Controls window opens.



RF Controls

Common GSM RF Control Values

Active Unit: Tx

Rx/Tx Channel: 37 897.400000

Band: GSM 900

AFC: -28

Operation Mode: Burst

RX Control Values

Monitor Channel: 37 942.400000

AGC: 22

TX Control Values

Edge: Off

Tx Data Type: Random

Tx PA Mode: High

Tx Power Level: 5

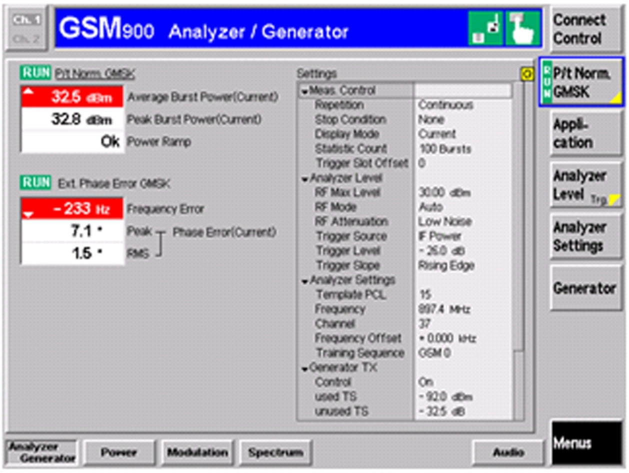
Figure 25 Phoenix RF Controls window

3. Make the following settings:

Setting	Value
Active Unit	Tx
Rx/Tx Channel	37
Band	GSM 900
AFC	-28
Operation Mode	Burst
Edge	Off
Tx Data Type	Random
Tx PA Mode	High
Tx Power Level	5

4. Check the basic TX parameters, using a communication analyser (e.g. CMU200).
    - Power
    - Phase error
    - Modulation
    - Switching spectrum

Analyser settings


GSM900 Analyzer / Generator
Connect Control
P/t Norm. GMSK
Appli- cation
Analyzer Level Trg
Analyzer Settings
Generator
Menus
Analyzer Generator
Power
Modulation
Spectrum
Audio

RUN P/t Norm. GMSK

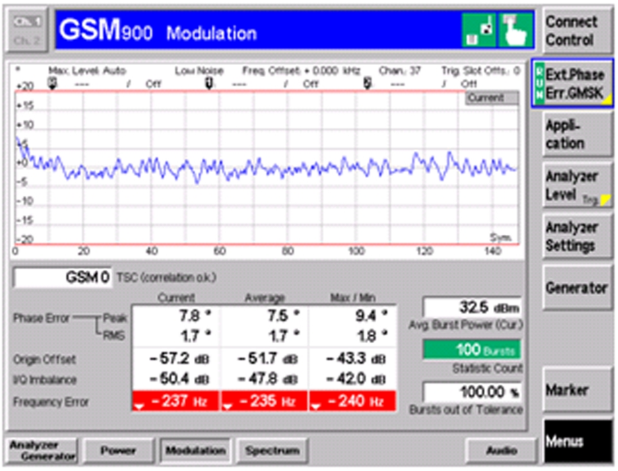
32.5 dBm Average Burst Power(Current)
32.8 dBm Peak Burst Power(Current)
Ok Power Ramp

RUN Ext. Phase Error GMSK

-233 Hz Frequency Error
7.1 ° Peak Phase Error(Current)
1.5 ° RMS

Settings	
Meas. Control	
Repetition	Continuous
Stop Condition	None
Display Mode	Current
Statistic Count	100 Bursts
Trigger Slot Offset	0
Analyzer Level	
RF Max Level	30.00 dBm
RF Mode	Auto
RF Attenuation	Low Noise
Trigger Source	IF Power
Trigger Level	-26.0 dB
Trigger Slope	Rising Edge
Analyzer Settings	
Template PCL	15
Frequency	897.4 MHz
Channel	37
Frequency Offset	+0.000 kHz
Training Sequence	GSM 0
Generator TX	
Control	On
used TS	-92.0 dBm
unused TS	-32.5 dB

Phase error

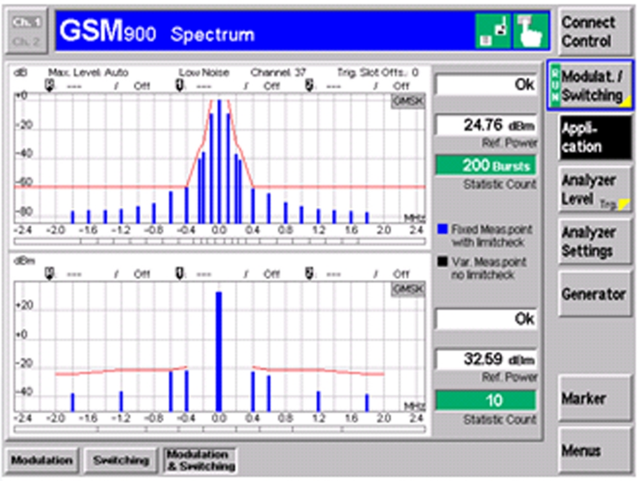

GSM900 Modulation
Max. Level: Auto
Low Noise
Freq. Offset: +0.000 kHz
Chan.: 37
Trig. Slot Offs.: 0
Off
Current
+20
+15
+10
-5
-10
-15
-20
0
20
40
60
80
100
120
140
Sym.
Connect Control
Ext.Phase Err.GMSK
Appli- cation
Analyzer Level Trg
Analyzer Settings
Generator
Marker
Menus
Analyzer Generator
Power
Modulation
Spectrum
Audio

GSM 0 TSC (correlation o.k.)

		Current	Average	Max / Min
Phase Error	Peak	7.8 °	7.5 °	9.4 °
	RMS	1.7 °	1.7 °	1.8 °
Origin Offset		-57.2 dB	-51.7 dB	-43.3 dB
I/Q Imbalance		-50.4 dB	-47.8 dB	-42.0 dB
Frequency Error		-237 Hz	-235 Hz	-240 Hz

32.5 dBm Avg. Burst Power (Cur.)
100 Bursts Statistic Count
100.00 % Bursts out of Tolerance

Modulation/Switching spectrum

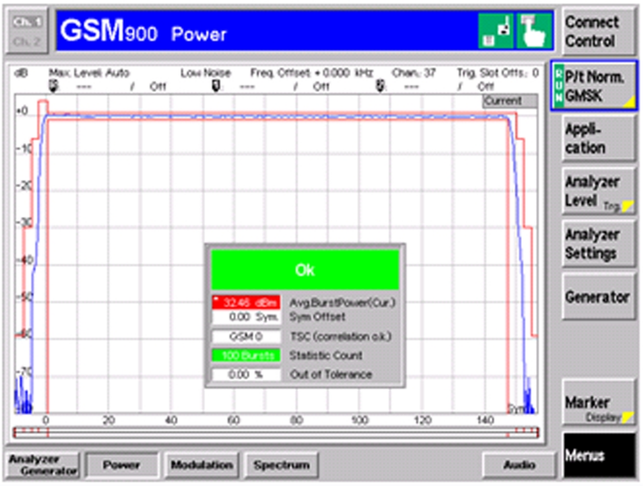

GSM900 Spectrum
dB
Max. Level: Auto
Low Noise
Channel: 37
Trig. Slot Offs.: 0
Off
GMSK
-20
-40
-60
-80
MHz
-2.4
-2.0
-1.6
-1.2
-0.8
-0.4
0.0
0.4
0.8
1.2
1.6
2.0
2.4
dBm
+20
+0
-20
-40
Connect Control
Modulat./ Switching
Appli- cation
Analyzer Level Trg
Analyzer Settings
Generator
Marker
Menus
Modulation
Switching
Modulation & Switching

Ok
24.76 dBm Ref. Power
200 Bursts Statistic Count

■ Fixed Meas.point with limitcheck
■ Var. Meas.point no limitcheck

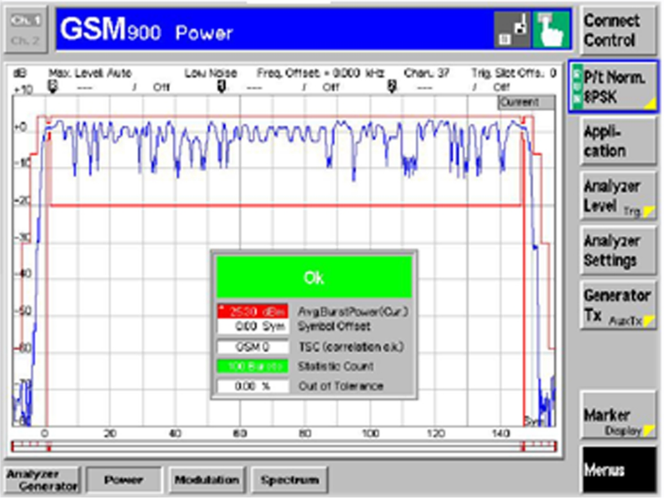
Ok
32.59 dBm Ref. Power
10 Statistic Count

Power/Burst GSM/GPRS (GMSK)


GSM900 Power
dB
Max. Level: Auto
Low Noise
Freq. Offset: +0.000 kHz
Chan.: 37
Trig. Slot Offs.: 0
Off
Current
+0
-10
-20
-30
-40
-50
-60
-70
0
20
40
60
80
100
120
140
Sym.
Connect Control
P/t Norm. GMSK
Appli- cation
Analyzer Level Trg
Analyzer Settings
Generator
Marker Display
Menus
Analyzer Generator
Power
Modulation
Spectrum
Audio

Ok
32.46 dBm Avg.BurstPower(Cur.)
0.00 Sym. Sym.Offset
GSM 0 TSC (correlation o.k.)
100 Bursts Statistic Count
0.00 % Out of Tolerance

Power/Burst - EDGE (8PSK)


GSM900 Power
dB
Max. Level: Auto
Low Noise
Freq. Offset: +0.000 kHz
Chan.: 37
Trig. Slot Offs.: 0
Off
Current
+10
+0
-10
-20
-30
-40
-50
-60
0
20
40
60
80
100
120
140
Sym
Connect Control
P/t Norm. 8PSK
Appli- cation
Analyzer Level Trg
Analyzer Settings
Generator Tx AuxTx
Marker Display
Menus
Analyzer Generator
Power
Modulation
Spectrum

Ok
25.30 dBm AvgBurstPower(Cur.)
0.00 Sym Symbol Offset
GSM 0 TSC (correlation o.k.)
100 Bursts Statistic Count
0.00 % Out of Tolerance

Figure 26 Typical readings

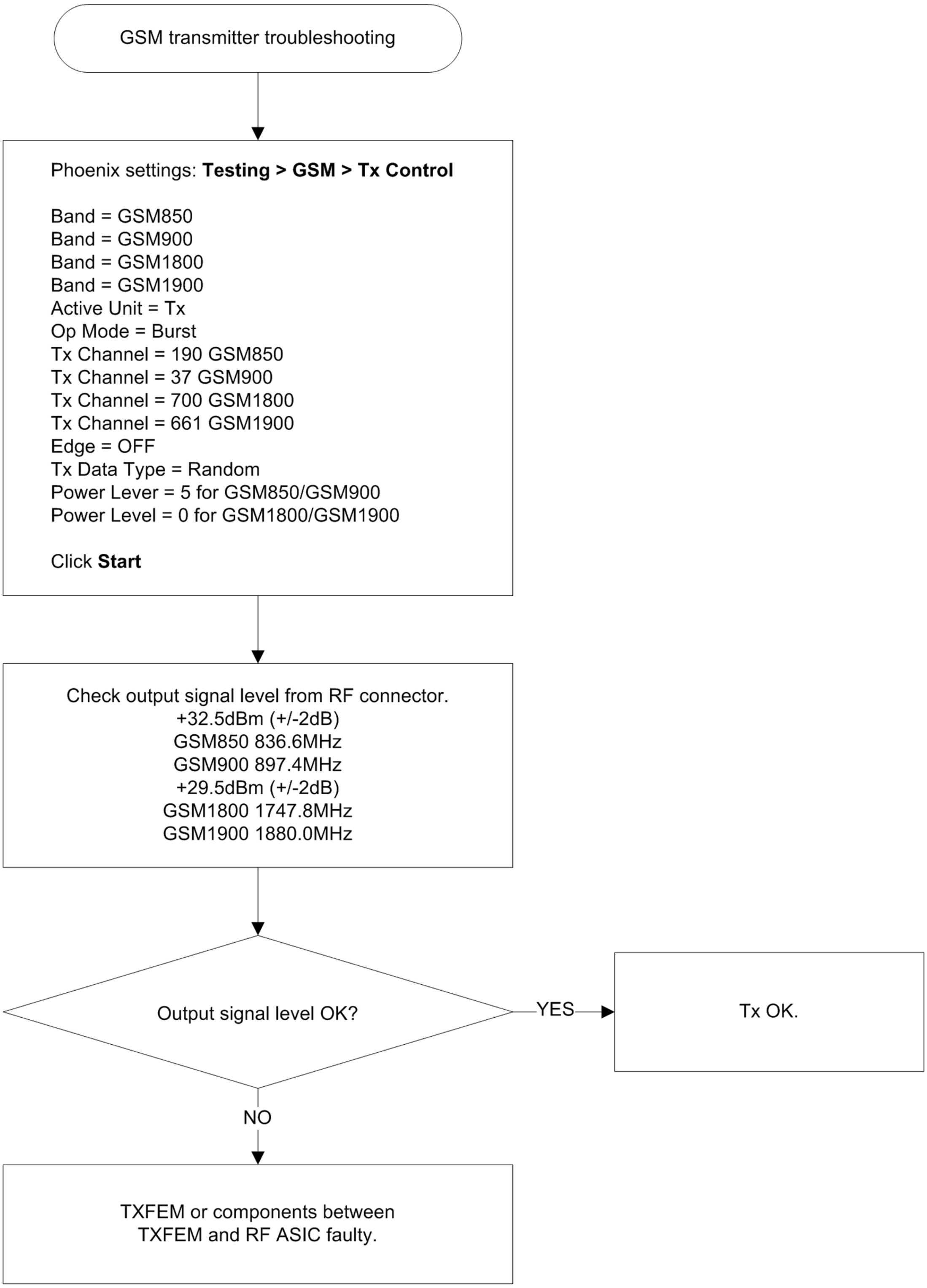
5. Change the power level in RF controls window and make sure the power reading follows accordingly.

Next actions

You can troubleshoot the GSM transmitter for each GSM band separately, one band at a time. If you want to troubleshoot GSM850, GSM1800 or GSM1900, change the band in the RF controls window and set the communication analyser accordingly.

GSM transmitter troubleshooting flowchart

Troubleshooting flow


GSM transmitter troubleshooting
Check output signal level from RF connector.
+32.5dBm (+/-2dB)
GSM850 836.6MHz
GSM900 897.4MHz
+29.5dBm (+/-2dB)
GSM1800 1747.8MHz
GSM1900 1880.0MHz
Output signal level OK?
YES
Tx OK.
NO
TXFEM or components between TXFEM and RF ASIC faulty.

Phoenix settings: **Testing > GSM > Tx Control**

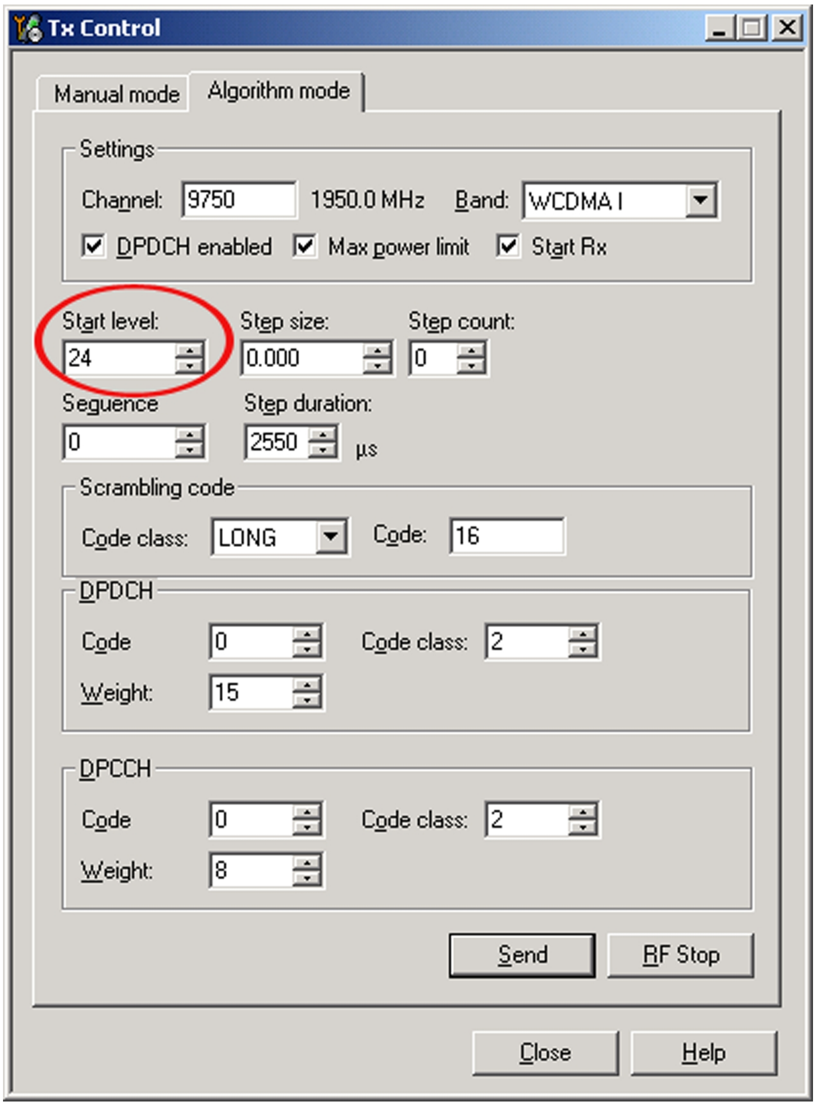
Band = GSM850
Band = GSM900
Band = GSM1800
Band = GSM1900
Active Unit = Tx
Op Mode = Burst
Tx Channel = 190 GSM850
Tx Channel = 37 GSM900
Tx Channel = 700 GSM1800
Tx Channel = 661 GSM1900
Edge = OFF
Tx Data Type = Random
Power Lever = 5 for GSM850/GSM900
Power Level = 0 for GSM1800/GSM1900

Click **Start**

WCDMA transmitter troubleshooting

Steps

1. Set the phone to local mode.
2. In Phoenix, select **Testing→WCDMA→Tx control** . The Tx Control window opens.



Settings
Channel: 9750 1950.0 MHz Band: WCDMA I
☑ DPDCH enabled ☑ Max power limit ☑ Start Rx

Start level: 24
Step size: 0.000
Step count: 0
Sequence 0
Step duration: 2550 µs

Scrambling code
Code class: LONG
Code: 16

DPDCH
Code 0
Code class: 2
Weight: 15

DPCCH
Code 0
Code class: 2
Weight: 8

Figure 27 Phoenix WCDMA Tx control window

3. Make settings for the band to be tested, according to the following table:

Band	Channel
WCDMA I	9750
WCDMA II	9400
WCDMA VIII	2788

4. Make the following general settings (the same values for all bands). Note that Max power limit is not checked by default.

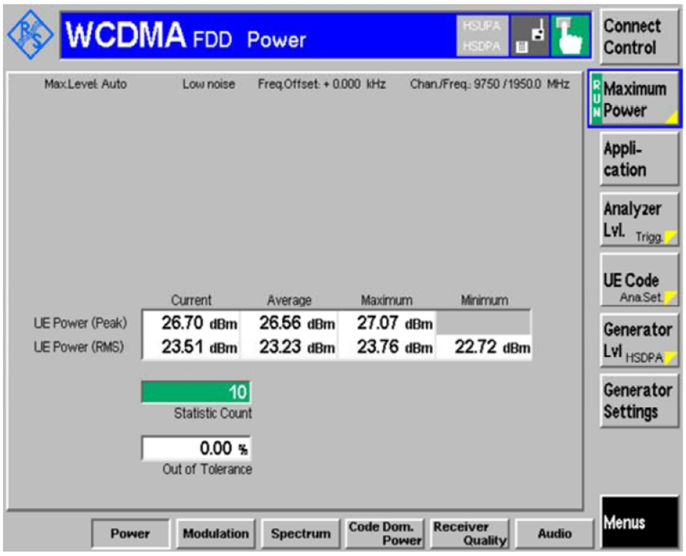
Setting	Value
DPDCH enabled	Checked
Max power limit	Checked
Start Rx	Checked
Start level	24
Step size	0
Step count	0
Sequency	0
Step duration	2550
Code class	LONG
Code	16
DPDCH code	0
Weight	15
Code class	2
DPCCH code	0
Weight	8
Code class	2

Note: Use the **Start level** option to set the TX power level.

5. Click **Send** to enable the settings and activate TX.

   If settings are changed (eg. new channel selected), you have to click **RF Stop** and **Send** again.
6. Check the basic TX parameters using a communication analyser (e.g. CMU200).

Power


WCDMA FDD Power
HSUPA
HSDPA
Connect Control
Maximum Power
Appli-cation
Analyzer Lvl. Trigg.
UE Code Ana.Set.
Generator Lvl HSDPA
Generator Settings
Menus
Power
Modulation
Spectrum
Code Dom. Power
Receiver Quality
Audio

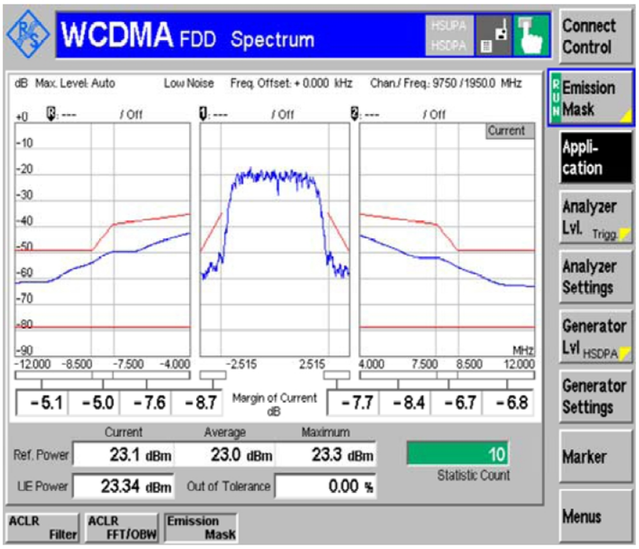
Max.Level: Auto Low noise Freq.Offset: + 0.000 kHz Chan./Freq.: 9750 / 1950.0 MHz

	Current	Average	Maximum	Minimum
UE Power (Peak)	26.70 dBm	26.56 dBm	27.07 dBm	
UE Power (RMS)	23.51 dBm	23.23 dBm	23.76 dBm	22.72 dBm

10 Statistic Count

0.00 % Out of Tolerance

Spectrum - Emission Mask


WCDMA FDD Spectrum
HSUPA
HSDPA
Connect Control
Emission Mask
Appli-cation
Analyzer Lvl. Trigg.
Analyzer Settings
Generator Lvl HSDPA
Generator Settings
Marker
Menus
ACLR Filter
ACLR FFT/OBW
Emission Mask
/ Off
Current
+0
-10
-20
-30
-40
-50
-60
-70
-80
-90
MHz
-12.000
-8.500
-7.500
-4.000
-2.515
2.515
4.000
7.500
8.500
12.000

dB Max. Level: Auto Low Noise Freq. Offset: + 0.000 kHz Chan./Freq.: 9750 / 1950.0 MHz

Margin of Current dB: -5.1 -5.0 -7.6 -8.7 -7.7 -8.4 -6.7 -6.8

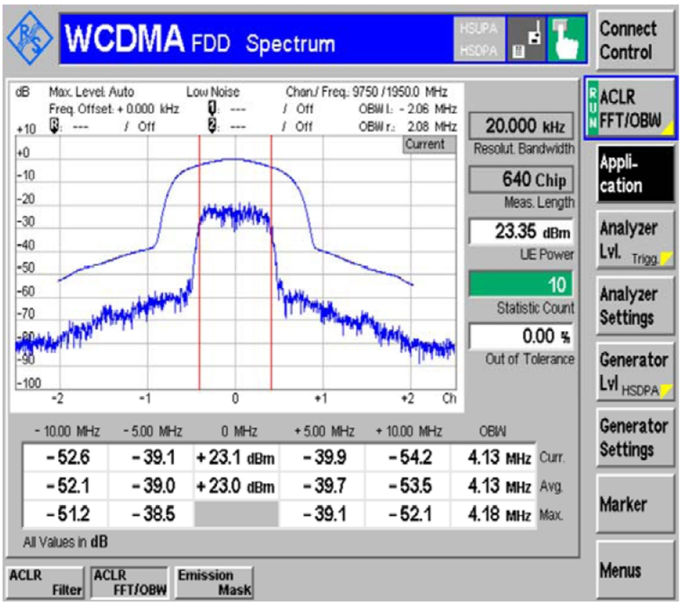
	Current	Average	Maximum
Ref. Power	23.1 dBm	23.0 dBm	23.3 dBm

UE Power 23.34 dBm

Out of Tolerance 0.00 %

10 Statistic Count

Spectrum - ACLR (FFT/OBW)


WCDMA FDD Spectrum
HSUPA
HSDPA
Connect Control
ACLR FFT/OBW
Appli-cation
Analyzer Lvl. Trigg.
Analyzer Settings
Generator Lvl HSDPA
Generator Settings
Marker
Menus
ACLR Filter
ACLR FFT/OBW
Emission Mask
Current
+10
+0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-2
-1
0
+1
+2
Ch

dB Max. Level: Auto Low Noise Chan./Freq.: 9750 / 1950.0 MHz
Freq. Offset: + 0.000 kHz
OBW l: - 2.06 MHz
OBW r: 2.08 MHz

20.000 kHz Resolut. Bandwidth

640 Chip Meas. Length

23.35 dBm UE Power

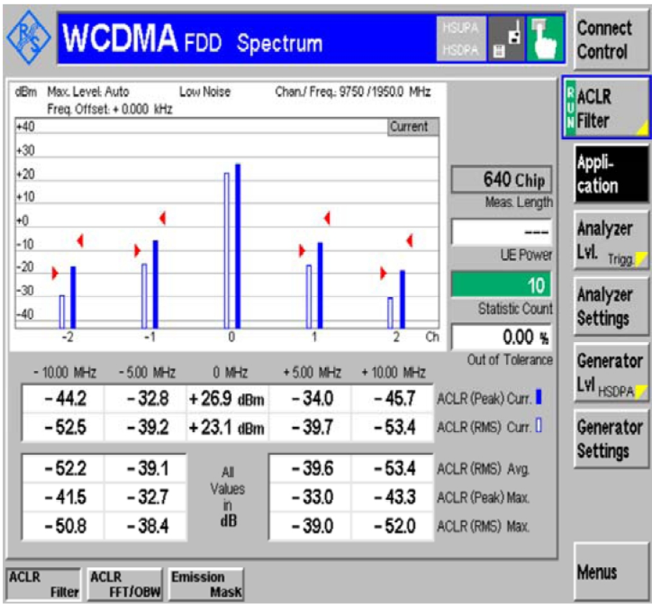
10 Statistic Count

0.00 % Out of Tolerance

- 10.00 MHz	- 5.00 MHz	0 MHz	+ 5.00 MHz	+ 10.00 MHz	OBW	
- 52.6	- 39.1	+ 23.1 dBm	- 39.9	- 54.2	4.13 MHz	Curr.
- 52.1	- 39.0	+ 23.0 dBm	- 39.7	- 53.5	4.13 MHz	Avg.
- 51.2	- 38.5		- 39.1	- 52.1	4.18 MHz	Max.

All Values in dB

Spectrum - ACLR (Filter)


WCDMA FDD Spectrum
HSUPA
HSDPA
Connect Control
ACLR Filter
Appli-cation
Analyzer Lvl. Trigg.
Analyzer Settings
Generator Lvl HSDPA
Generator Settings
Menus
ACLR Filter
ACLR FFT/OBW
Emission Mask
Current
+40
+30
+20
+10
+0
-10
-20
-30
-40
-2
-1
0
1
2
Ch

dBm Max. Level: Auto Low Noise Chan./Freq.: 9750 / 1950.0 MHz
Freq. Offset: + 0.000 kHz

640 Chip Meas. Length

--- UE Power

10 Statistic Count

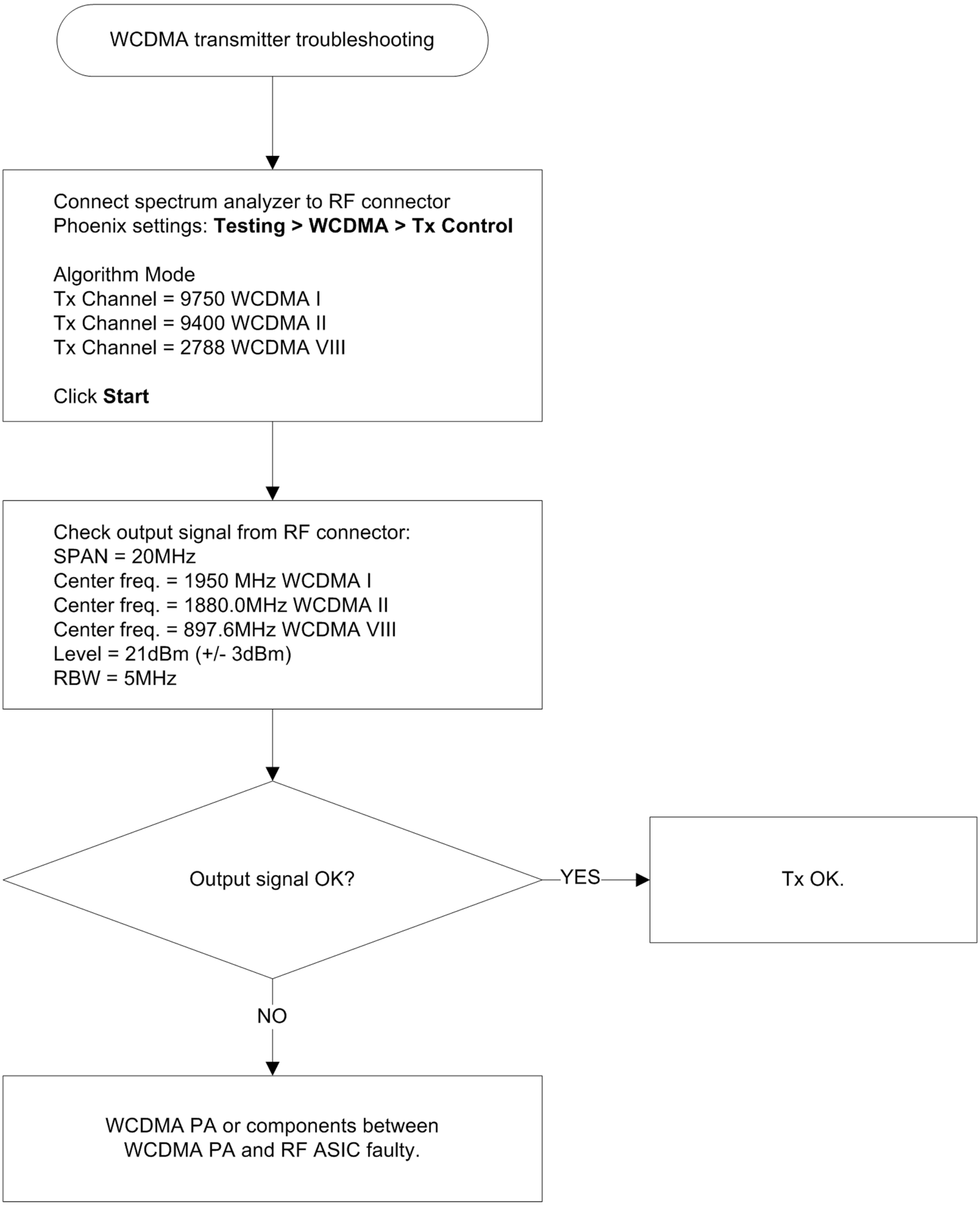
0.00 % Out of Tolerance

- 10.00 MHz	- 5.00 MHz	0 MHz	+ 5.00 MHz	+ 10.00 MHz	
- 44.2	- 32.8	+ 26.9 dBm	- 34.0	- 45.7	ACLR (Peak) Curr.
- 52.5	- 39.2	+ 23.1 dBm	- 39.7	- 53.4	ACLR (RMS) Curr.
- 52.2	- 39.1	All Values in dB	- 39.6	- 53.4	ACLR (RMS) Avg.
- 41.5	- 32.7		- 33.0	- 43.3	ACLR (Peak) Max.
- 50.8	- 38.4		- 39.0	- 52.0	ACLR (RMS) Max.

Figure 28 Typical readings

WCDMA transmitter troubleshooting flowchart

Troubleshooting flow


WCDMA transmitter troubleshooting
Connect spectrum analyzer to RF connector
Phoenix settings: Testing > WCDMA > Tx Control
Algorithm Mode
Tx Channel = 9750 WCDMA I
Tx Channel = 9400 WCDMA II
Tx Channel = 2788 WCDMA VIII
Click Start
Check output signal from RF connector:
SPAN = 20MHz
Center freq. = 1950 MHz WCDMA I
Center freq. = 1880.0MHz WCDMA II
Center freq. = 897.6MHz WCDMA VIII
Level = 21dBm (+/- 3dBm)
RBW = 5MHz
Output signal OK?
YES
Tx OK.
NO
WCDMA PA or components between WCDMA PA and RF ASIC faulty.

Troubleshooting with RF-shield removed

Introduction

The RF-shield should not be removed in order to replace single components on the RF block. This chapter only assists in locating the faulty component for statistical purposes.

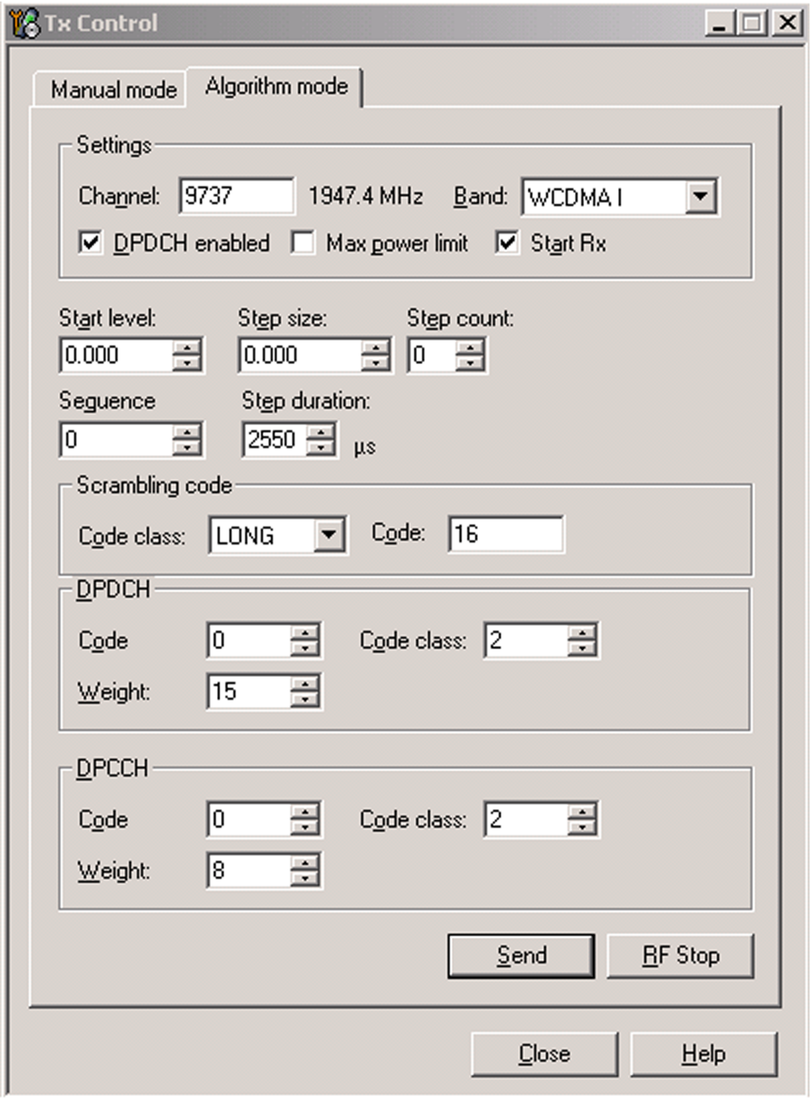
Voltage checking

Steps

1. Set up the main board in the module jig. The phone should be in local mode.
2. Check the following:

TP#	Signal name	Test point	Voltage (all bands)
1	VCTCXO (G7500) supply	C7501	2.5V
2	RFIC Vapaus (N7500) supply from DC/DC converter	C7570	2.8V
3	TXFEM (N7520) supply from DC/DC converter	C7521	1.3V-3.8V (only when transmitting and depends on output power).
4	WCDMA PA (N7540) supply from DC/DC converter	C7528	0.7V-3.1V (only when transmitting and depends on output power). The value will be 3.1V when settings as described in the note below are used.
5	Vbat at WCDMA PA (N7540)	C7512	3.7V (Vbattery)
6	Supply input to DC/DC conv	C7527	3.7V (Vbattery)

Note: When using settings as shown in the following Tx Control window, the result at TP4 should be 3.1V.


Tx Control
Manual mode
Algorithm mode
Send
RF Stop
Close
Help

Settings

Channel: 9737 1947.4 MHz Band: WCDMA I

☑ DPDCH enabled ☐ Max power limit ☑ Start Rx

Start level: 0.000

Step size: 0.000

Step count: 0

Sequence 0

Step duration: 2550 µs

Scrambling code

Code class: LONG

Code: 16

DPDCH

Code 0

Code class: 2

Weight: 15

DPCCH

Code 0

Code class: 2

Weight: 8

Figure 29 Phoenix WCDMA Tx Control window settings

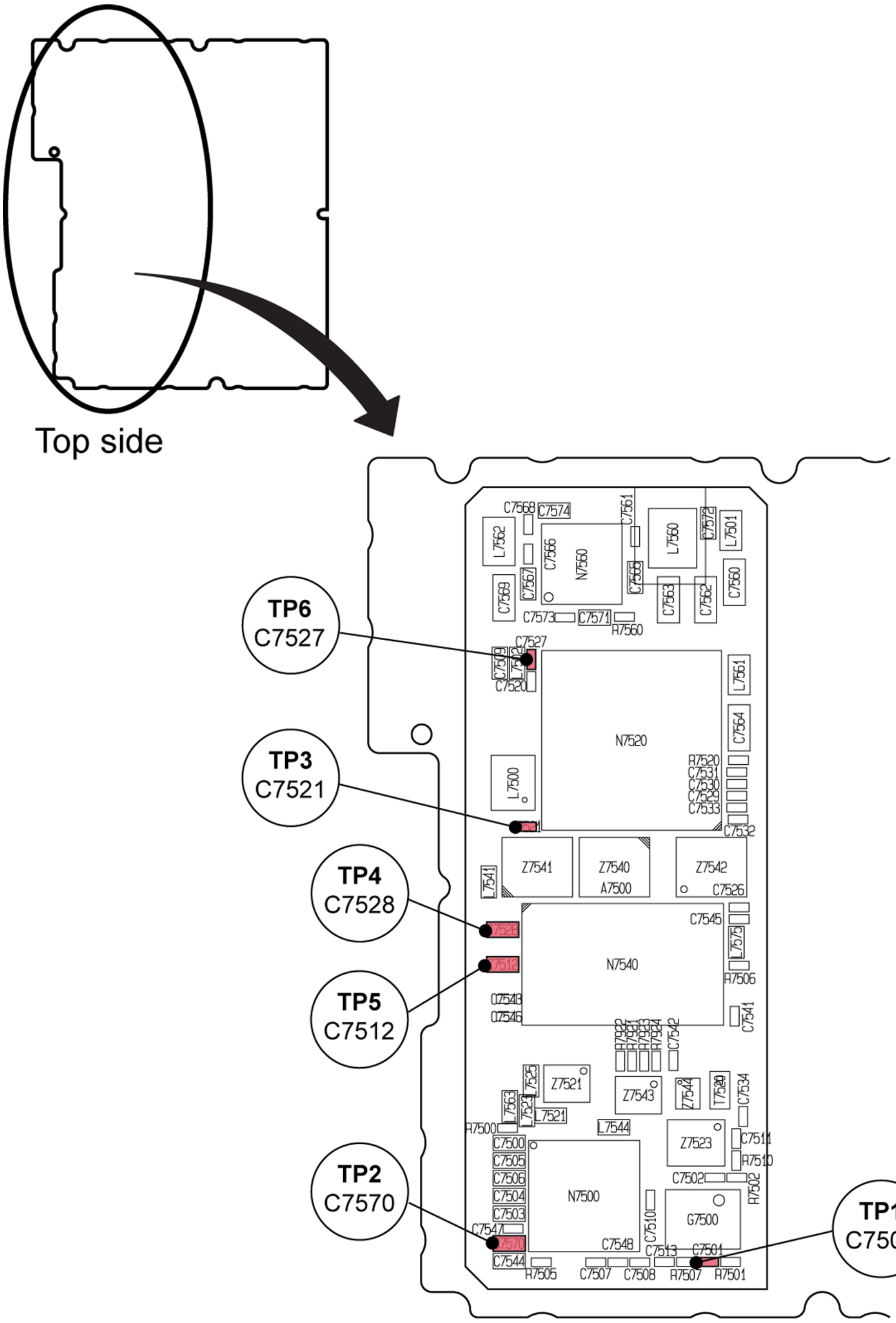
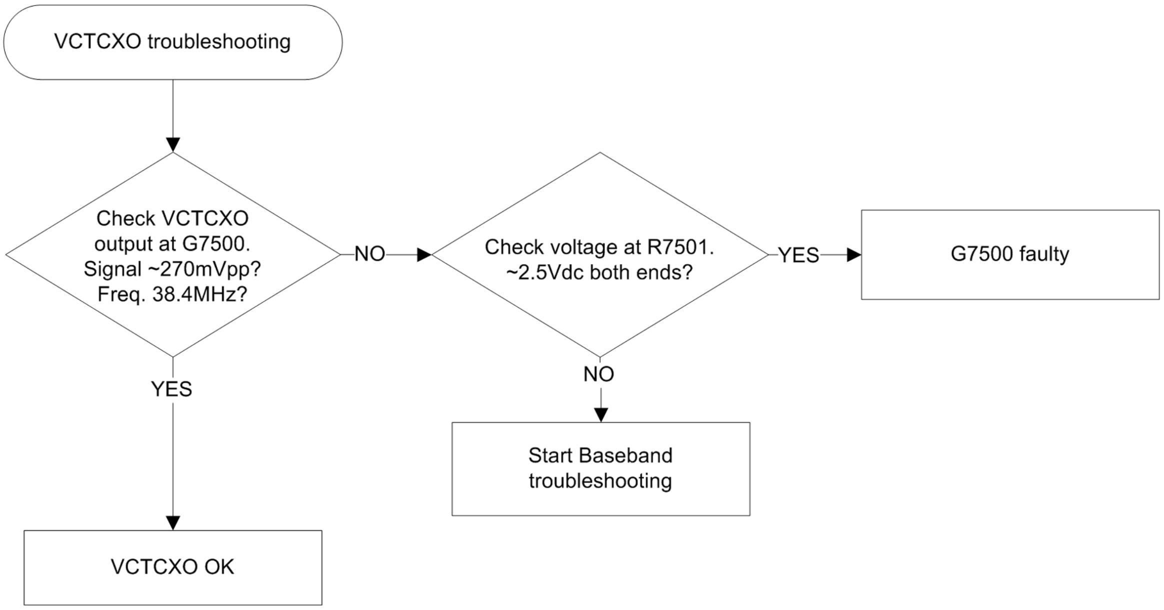

Top side
TP6
C7527
TP3
C7521
TP4
C7528
TP5
C7512
TP2
C7570
TP1
C7501
N7560
N7520
N7540
N7500
Z7541
Z7540
A7500
Z7542
Z7521
Z7543
Z7523
G7500
L7500
L7544
L7521

Figure 30 Test points for voltage checking

VCTCXO troubleshooting

Troubleshooting flow


VCTCXO troubleshooting
Check VCTCXO output at G7500. Signal ~270mVpp? Freq. 38.4MHz?
NO
Check voltage at R7501. ~2.5Vdc both ends?
YES
G7500 faulty
NO
Start Baseband troubleshooting
YES
VCTCXO OK

RF component reference

Component reference table

This table shows the components used for the different bands. It can be used as a reference when troubleshooting which components may or may not be faulty.

	GSM850		**GSM900**		**GSM1800**		**GSM1900**		**WCDMA1**		**WCDMA2**		**WCDMA8**	
Reference	**RX**	**TX**	**RX**	**TX**	**RX**	**TX**	**RX**	**TX**	**RX**	**TX**	**RX**	**TX**	**RX**	**TX**
G7500	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L7500	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N7500	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N7520	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N7540										X		X		X
N7560	X	X	X	X	X	X	X	X	X	X	X	X	X	X
T7520						X		X						
Z7521	X				X									
Z7523		X		X										
Z7540							X				X	X		
Z7541									X	X				
Z7542			X										X	X
Z7543										X		X		
Z7544														X

X means that the component is used for the band in the current column.

For further reference, see Component reference schematics on the following page.

RF block diagram

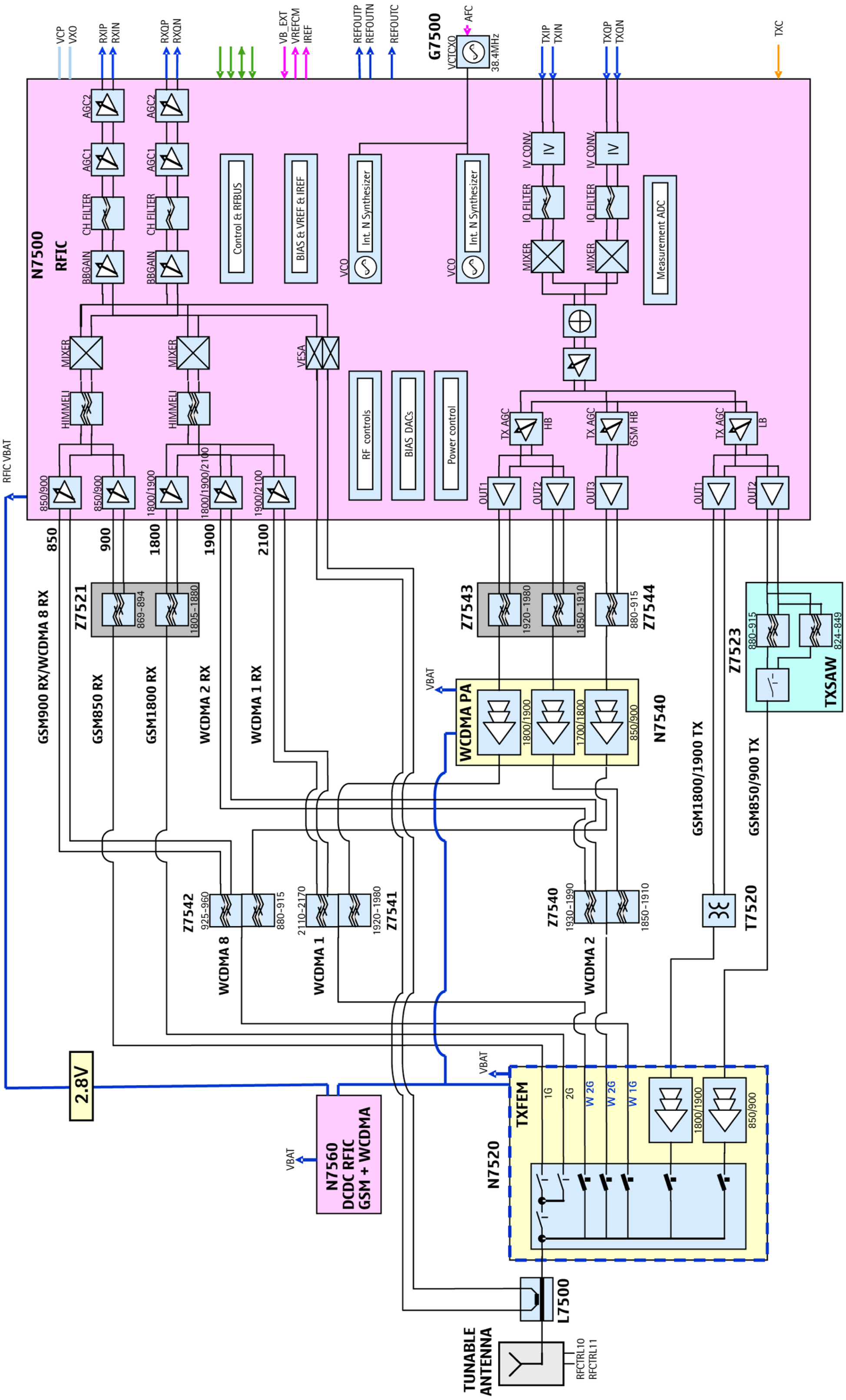

VCP
VXO
RXIP
RXIN
RXQP
RXQN
VB_EXT
VREFCM
IREF
REFOUTP
REFOUTN
REFOUTC
G7500
VCTCXO
AFC
38.4MHz
TXIP
TXIN
TXQP
TXQN
TXC
N7500
RFIC
AGC2
AGC1
CH FILTER
BBGAIN
Control & RFBUS
BIAS & VREF & IREF
VCO
Int. N Synthesizer
IV CONV
IQ FILTER
MIXER
Measurement ADC
HIMMELI
VESA
RF controls
BIAS DACs
Power control
TX AGC
HB
GSM HB
LB
OUT1
OUT2
OUT3
850/900
1800/1900
1800/1900/2100
1900/2100
RFIC VBAT
850
900
1800
1900
2100
Z7521
869–894
1805–1880
Z7543
1920–1980
1850–1910
880–915
Z7544
GSM900 RX/WCDMA 8 RX
GSM850 RX
GSM1800 RX
WCDMA 2 RX
WCDMA 1 RX
VBAT
WCDMA PA
1700/1800
N7540
Z7523
824–849
TXSAW
GSM1800/1900 TX
GSM850/900 TX
Z7542
925–960
WCDMA 8
2110–2170
WCDMA 1
Z7541
Z7540
1930–1990
WCDMA 2
T7520
2.8V
N7560
DCDC RFIC
GSM + WCDMA
TXFEM
1G
2G
W 2G
W 1G
N7520
L7500
TUNABLE
ANTENNA
RFCTRL10
RFCTRL11

Figure 31 Component reference block diagram

Antenna

Antenna overview

The phone has one antenna module. The antenna module is covering GSM and WCDMA bands along with GPS and BT. The antenna module consists of a antenna carrier and an LDS antenna, where the antenna pattern is directly deposited on the antenna carrier.

The antenna module also acts as IHF chamber, and contains a speaker and an earpiece. The main antenna has one feed pad for GSM and WCDMA, one feed pad for GPS, one feed pad for BT, one antenna switch pad and two ground pads. All six pads connect to C-springs mounted on the AV-flex.

Main antenna functionality

The antenna module is functioning normally when all six contact pads take proper contact to the C-springs on the AV-flex, and the and the antenna pattern is electrically intact.

The main antenna functionality must also be checked by measuring the transmitted power with RF coupler at GSM900 channel 124.

Antenna troubleshooting

Antenna contacts, visual check

The antenna module has one feed pad for GSM and WCDMA, one feed pad for GPS, one feed pad for BT, one antenna switch pad and two ground pads. Check that all pads take proper contact to the C-clips on the AV-flex.

Antenna matching components and antenna switch related components, visual check

There is one filtering component on GSM/WCDMA feed, two matching components on GPS feed and two matching components on BT feed. There are also 20 antenna switch related components located at the antenna switch connection and next to the antenna switch.

All matching and antenna switch related components are soldered on the AV-flex. Check visually that all components are properly soldered on the AV-flex. In the case of damage you need to replace the AV-flex.

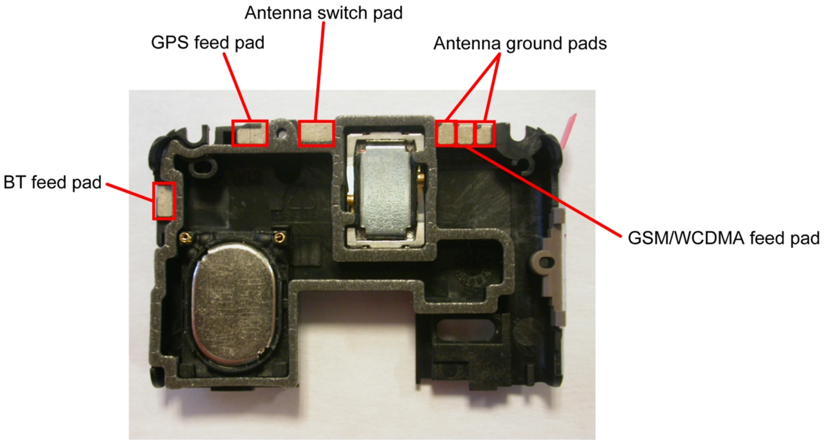


Figure 32 Antenna contacts

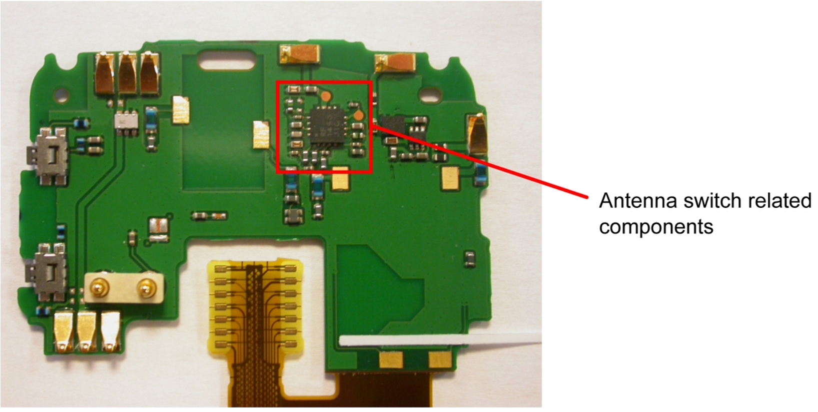

Antenna switch related components

Figure 33 Antenna switch related components

5 — System Module

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USB 5–14
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MicroUSB connector 5–14
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Display interface 5–15
Keyboard interface 5–15
Ambient light sensor (ALS) interface 5–16
Accelerometer 5–16
GPS interface 5–17
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Transmitter (TX) 5–20

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Introduction

Phone description

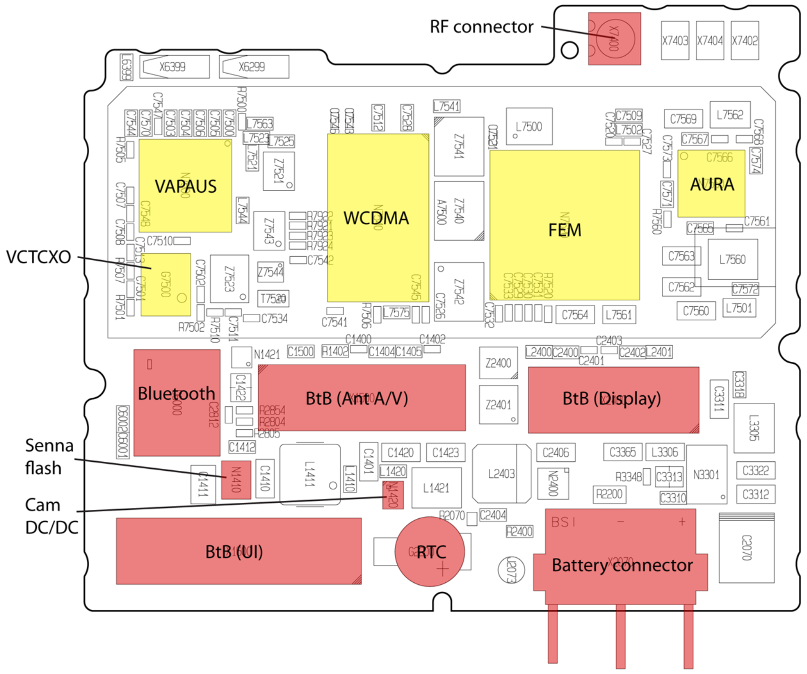
RAPU is the main digital baseband ASIC in the phone. It contains functionality for both WCDMA and GSM EDGE. Gazoo (N2200) is main audio and energy management controller for the phone.

Key components

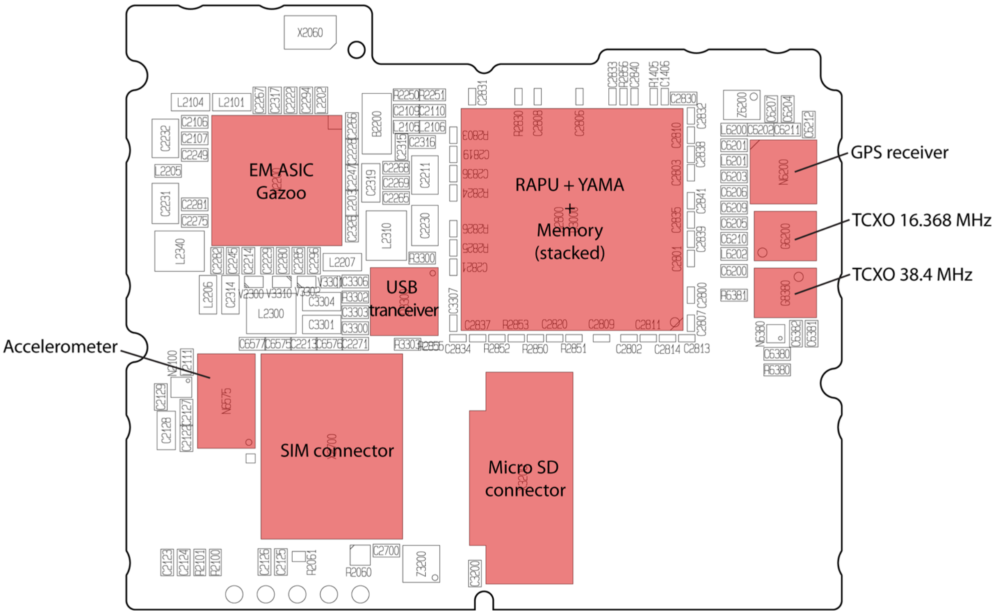
Function	Description	Item ref
Main PWB	2rwa	
Ant A/V flex	2rwb	
UI flex	2rwc	
USB Interposer	2rwd	
Display flex	2rwe	
Baseband ASIC	EM ASIC Gazoo	N2200
RF ASIC	VAPAUS	N7500
Processor	RAPU	D2800
GSM PA	Front end module (FEM), quad band	N7520
WCDMA PA		N7540
Oscillators	VCTCXO Balun GSM	G7500 T7520
Memory	Combo 512 M DDR + 1 M M3 (stacked with RAPU)	D3000
Back-up battery	RTC back-up battery 311	G2200
Bluetooth	BTHFMRDS2.1M module	D6000
GPS	GPS receiver	N6200
USB	USB tranceiver	D3300
Accelerometer		N6575
Battery	BL-6Q	
Battery connector	Tabby blade interface	X2070
MicroSD connector		X3200
BTB connectors	Ant A/V	X1500
	UI	X1600
	Display	X2400
RF connector		X7400
SIM connector		X2700
Charging connector		X2000

Key component placement

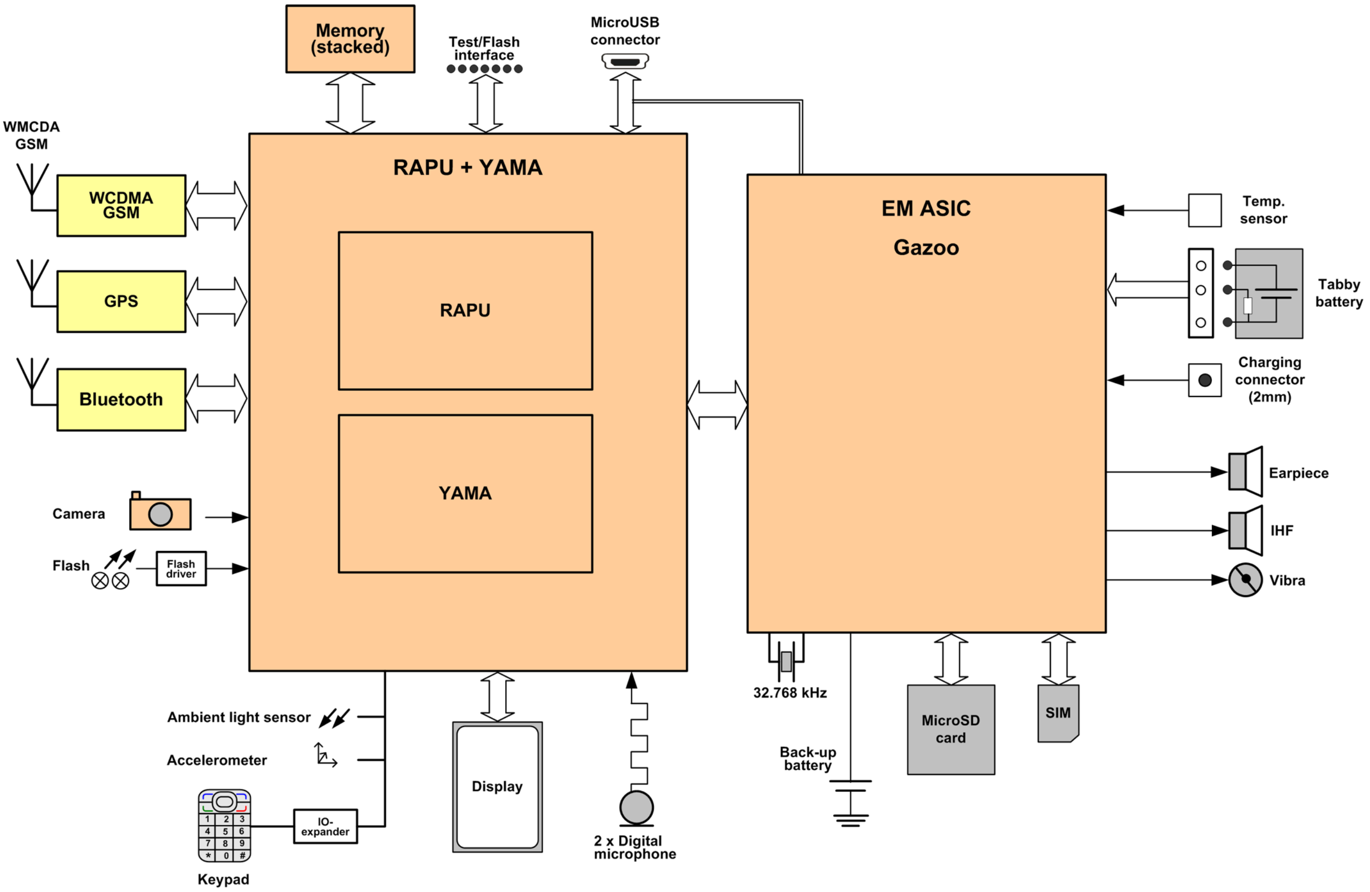
Top side


RF connector
VAPAUS
WCDMA
FEM
AURA
VCTCXO
Bluetooth
BtB (Ant A/V)
BtB (Display)
Senna
flash
Cam
DC/DC
BtB (UI)
RTC
Battery connector

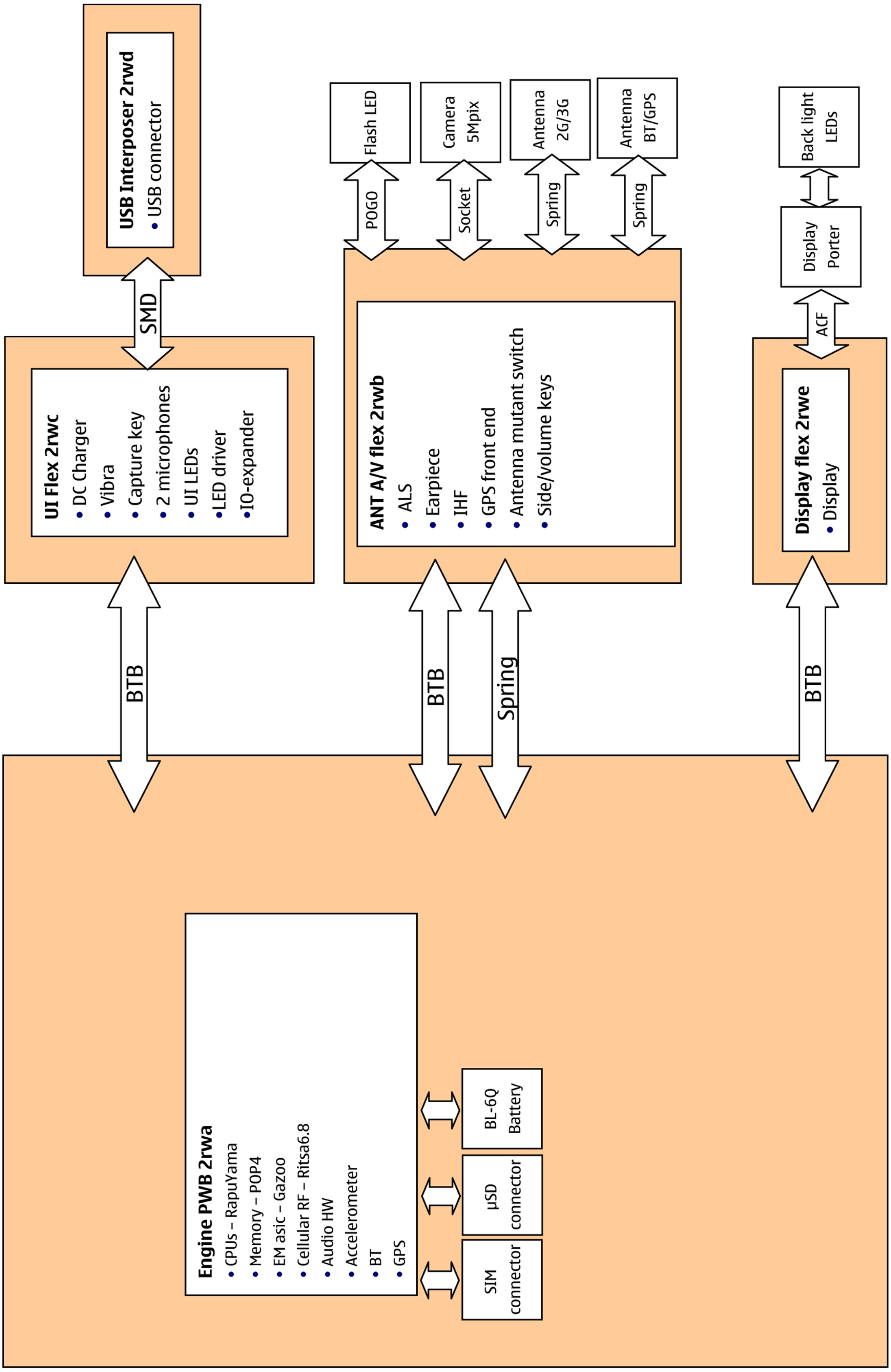
Bottom side


EM ASIC
Gazoo
RAPU + YAMA
+
Memory
(stacked)
GPS receiver
TCXO 16.368 MHz
TCXO 38.4 MHz
USB
tranceiver
Accelerometer
SIM connector
Micro SD
connector

System module block diagram


Memory (stacked)
Test/Flash interface
MicroUSB connector
WMCDA GSM
WCDMA GSM
GPS
Bluetooth
Camera
Flash
Flash driver
RAPU + YAMA
RAPU
YAMA
EM ASIC
Gazoo
Temp. sensor
Tabby battery
Charging connector (2mm)
Earpiece
IHF
Vibra
32.768 kHz
Back-up battery
MicroSD card
SIM
Ambient light sensor
Accelerometer
IO-expander
Keypad
Display
2 x Digital microphone

Board and module connections


USB Interposer 2rwd
• USB connector
SMD
UI Flex 2rwc
• DC Charger
• Vibra
• Capture key
• 2 microphones
• UI LEDs
•LED driver
•IO-expander
BTB
Flash LED
Camera 5Mpix
Antenna 2G/3G
Antenna BT/GPS
POGO
Socket
Spring
Spring
ANT A/V flex 2rwb
• ALS
• Earpiece
• IHF
• GPS front end
• Antenna mutant switch
• Side/volume keys
BTB
Spring
Back light LEDs
Display Porter
ACF
Display flex 2rwe
• Display
BTB
Engine PWB 2rwa
• CPUs – RapuYama
• Memory – POP4
• EM asic – Gazoo
• Cellular RF – Ritsa6.8
• Audio HW
• Accelerometer
• BT
• GPS
BL-6Q Battery
µSD connector
SIM connector

Energy management

Battery and charging

BL-6Q battery

The phone is powered by a 3-pole BL-6Q 960 mAh battery (Li-Ion). The three poles of the battery are named VBAT, BSI and GND, where the BSI line is used to recognize the battery capacity. This is done by means of an internal battery pull down resistor.

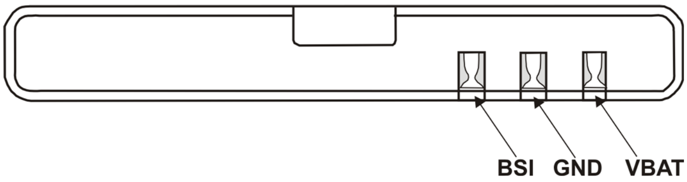


Figure 34 Battery pin order

The battery temperature is estimated by measuring separate battery temperature NTC via the BTEMP line of EM ASIC (N2200). This resistor is located on the main PWB, at a place where the phone temperature is closest to the battery temperature.

Battery connector

The battery connector is a blade connector. It has three blades;

- BSI (Battery size indicator)
- GND (Ground)
- VBAT (Battery voltage)

The BSI line is used to recognize the battery capacity by a battery internal pull down resistor.

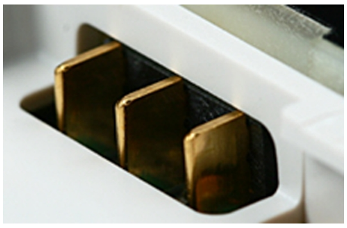


Figure 35 Blade battery connector

Charging

This phone is charged through the smaller Nokia standard interface (2.0 mm plug). The wider standard charger plug (3.5 mm) can be used together with a CA-44 charger adapter.

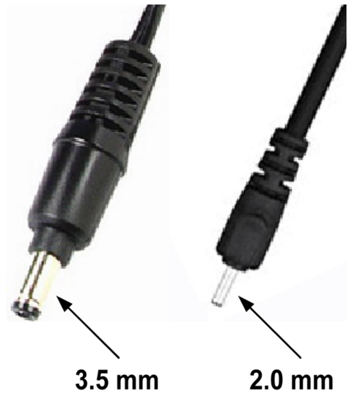


Figure 36 Small (right) and wide (left) charger plugs

The phone can also be charged via USB using CA-101.

Charging is controlled by EM ASIC (N2200), and external components are needed to protect the baseband module against EMC, reverse polarity and transient frequency deviation.

Charging a dead battery

Charging of a dead battery has to be carried out via an approved NOKIA charger. If the phone is charged via USB, CA-101 must be used.

Normal and extreme voltages

Energy management is mainly carried out in the EM ASIC (N2200). that contains a number of regulators. In addition there are also some external regulators.

In the table below normal and extreme voltages are shown when a BL-6Q battery is used.

Table 11 Nominal voltages

Voltage	Voltage [V]	Condition
General Conditions		
Nominal voltage	3.700	
Lower extreme voltage	3.145	
Higher extreme voltage (fast charging)	4.230	
HW Shutdown Voltages		
Vmstr+	2.1 ± 0.1	Off to on
Vmstr-	1.9 ± 0.1	On to off
SW Shutdown Voltages		
Sw shutdown	3.1	In call
Sw shutdown	3.2	In idle
Min Operating Voltage		
Vcoff+	2.9 ± 0.1	Off to on
Vcoff-	2.6 ± 0.1	On to off

Power key and system power-up

When the battery is placed in the phone, the power key circuits are energized. When the power key is pressed, the system boots up (if an adequate battery voltage is present).

Power down can be initiated by pressing the power key again and the system is powered down with the aid of SW. The power key is connected to EM ASIC (N2200) via the PWRONX signal.

Modes of operation

Mode	Description
NO_SUPPLY	(Dead) mode means that the main battery is not present or its voltage is too low (below EM ASIC master reset threshold) and that the back-up battery voltage is too low.
BACK_UP	The main battery is not present or its voltage is too low but back-up battery voltage is adequate and the 32 kHz oscillator is running (RTC is on).
PWR_OFF	In this mode (warm), the main battery is present and its voltage is over EM ASIC master reset threshold. All regulators are disabled, PurX is on low state, the RTC is on and the oscillator is on. PWR_OFF (cold) mode is almost the same as PWR_OFF (warm), but the RTC and the oscillator are off.
RESET	RESET mode is a synonym for start-up sequence. RESET mode uses 32kHz clock to count the REST mode delay (typically 16ms).
SLEEP	SLEEP mode is entered only from PWR_ON mode with the aid of SW when the system's activity is low.
FLASHING	FLASHING mode is for SW downloading.

Clocking scheme

In BB5.44, two main clocks are provided to the system: 38.4MHz RF clock produced by VCTCXO in the RF section and 32.768kHz sleep clock produced by EM ASIC N2200 with an external crystal.

32 k Sleep Clock is always powered on after startup. Sleep clock is used by RAPU for low-power operation.

SMPS Clk is 2.4MHz clock line from RAPU to EM ASIC N2200. In deep sleep mode, when VCTCXO is off, this signal is set to '0'-state.

CLK600. The clock source is an internal RC oscillator in EM ASIC N2200 (during the power-up sequence) or RAPU SMPS Clk.

Bluetooth and WLAN have a separate 38.4MHz TCXO clock oscillator.

Power distibution

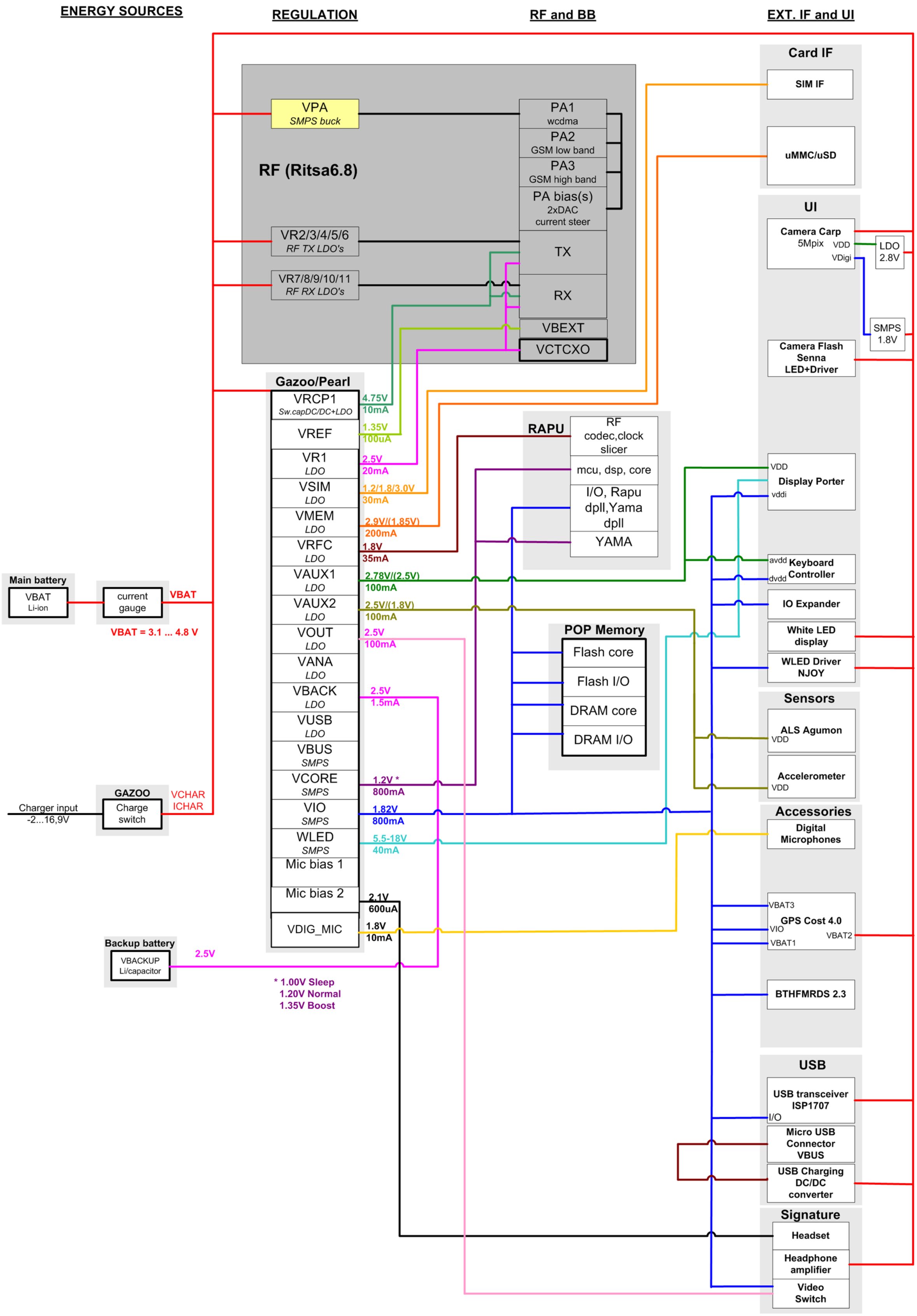

ENERGY SOURCES
REGULATION
RF and BB
EXT. IF and UI
RF (Ritsa6.8)
VPA
SMPS buck
PA1
wcdma
PA2
GSM low band
PA3
GSM high band
PA bias(s)
2xDAC
current steer
VR2/3/4/5/6
RF TX LDO's
TX
VR7/8/9/10/11
RF RX LDO's
RX
VBEXT
VCTCXO
Gazoo/Pearl
VRCP1
Sw.capDC/DC+LDO
4.75V
10mA
VREF
1.35V
100uA
VR1
LDO
2.5V
20mA
VSIM
LDO
1.2/1.8/3.0V
30mA
VMEM
LDO
2.9V/(1.85V)
200mA
VRFC
LDO
1.8V
35mA
VAUX1
LDO
2.78V/(2.5V)
100mA
VAUX2
LDO
2.5V/(1.8V)
100mA
VOUT
LDO
2.5V
100mA
VANA
LDO
VBACK
LDO
2.5V
1.5mA
VUSB
LDO
VBUS
SMPS
VCORE
SMPS
1.2V *
800mA
VIO
SMPS
1.82V
800mA
WLED
SMPS
5.5-18V
40mA
Mic bias 1
Mic bias 2
2.1V
600uA
VDIG_MIC
1.8V
10mA
* 1.00V Sleep
1.20V Normal
1.35V Boost
RAPU
RF
codec,clock
slicer
mcu, dsp, core
I/O, Rapu
dpll,Yama
dpll
YAMA
POP Memory
Flash core
Flash I/O
DRAM core
DRAM I/O
Main battery
VBAT
Li-ion
current
gauge
VBAT
VBAT = 3.1 ... 4.8 V
Charger input
-2...16,9V
GAZOO
Charge
switch
VCHAR
ICHAR
Backup battery
VBACKUP
Li/capacitor
2.5V
Card IF
SIM IF
uMMC/uSD
UI
Camera Carp
5Mpix
VDD
VDigi
LDO
2.8V
SMPS
1.8V
Camera Flash
Senna
LED+Driver
VDD
Display Porter
vddi
avdd
Keyboard
dvdd
Controller
IO Expander
White LED
display
WLED Driver
NJOY
Sensors
ALS Agumon
VDD
Accelerometer
VDD
Accessories
Digital
Microphones
VBAT3
GPS Cost 4.0
VIO
VBAT2
VBAT1
BTHFMRDS 2.3
USB
USB transceiver
ISP1707
I/O
Micro USB
Connector
VBUS
USB Charging
DC/DC
converter
Signature
Headset
Headphone
amplifier
Video
Switch

Figure 37 Power distribution diagram

SIM interface

The phone has a SIM (Subscriber Identification Module) interface including a SIM connector. The connector is only accessible when the battery is removed.

The SIM interface consists of an internal interface between RAPU and EM ASIC (N2200), and an external interface between EM ASIC and SIM contacts.

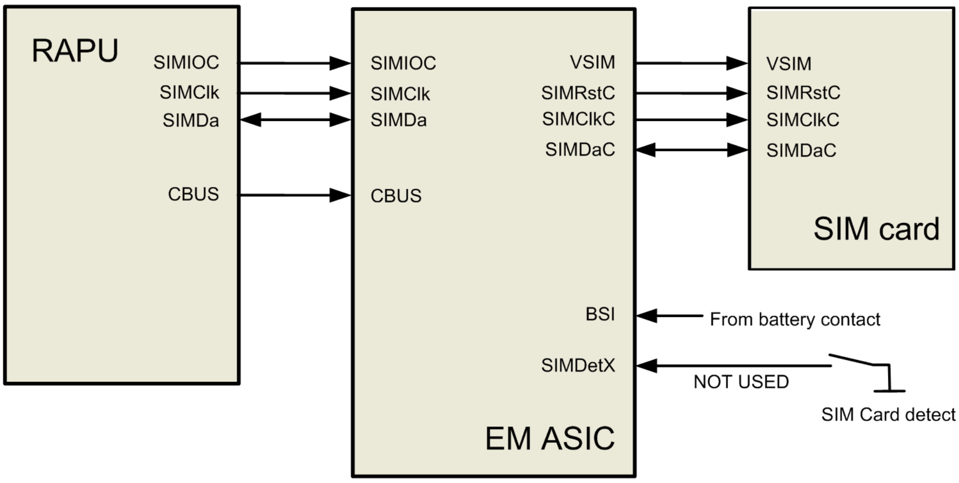

RAPU
SIMIOC
SIMClk
SIMDa
CBUS
SIMIOC
SIMClk
SIMDa
CBUS
VSIM
SIMRstC
SIMClkC
SIMDaC
BSI
SIMDetX
EM ASIC
VSIM
SIMRstC
SIMClkC
SIMDaC
SIM card
From battery contact
NOT USED
SIM Card detect

Figure 38 SIM interface

The EM ASIC handles the detection of the SIM card. The detection method is based on the BSI line. Because of the location of the SIM connector, removing the battery causes a quick power down of the SIM interface.

The SIM interface supports both 1.8V and 3.0V SIM cards. The SIM interface voltage is first 1.8 V when the SIM card is inserted, and if the card does not response to the ATR (Answer to Request), a 3V interface voltage is used.

MicroSD card interface

The microSD card interface has one internal interface between RAPU and EM ASIC and one external interface between EM ASIC and the microSD card. The microSD card connector is mounted on a separate PWB, the Micro PWB.

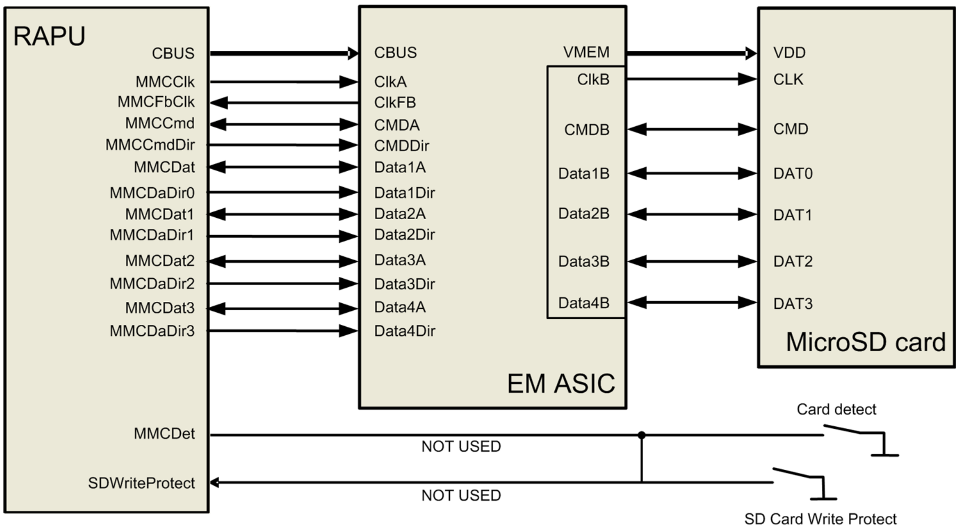

RAPU
CBUS
MMCClk
MMCFbClk
MMCCmd
MMCCmdDir
MMCDat
MMCDaDir0
MMCDat1
MMCDaDir1
MMCDat2
MMCDaDir2
MMCDat3
MMCDaDir3
MMCDet
SDWriteProtect
CBUS
ClkA
ClkFB
CMDA
CMDDir
Data1A
Data1Dir
Data2A
Data2Dir
Data3A
Data3Dir
Data4A
Data4Dir
VMEM
ClkB
CMDB
Data1B
Data2B
Data3B
Data4B
EM ASIC
VDD
CLK
CMD
DAT0
DAT1
DAT2
DAT3
MicroSD card
Card detect
NOT USED
NOT USED
SD Card Write Protect

Figure 39 MicroSD card interface

USB

USB interface

The phone has an interface for USB (Universal Serial Bus). USB is a differential serial bus that provides a wired connectivity between the phone and, for example, a PC or a headset.

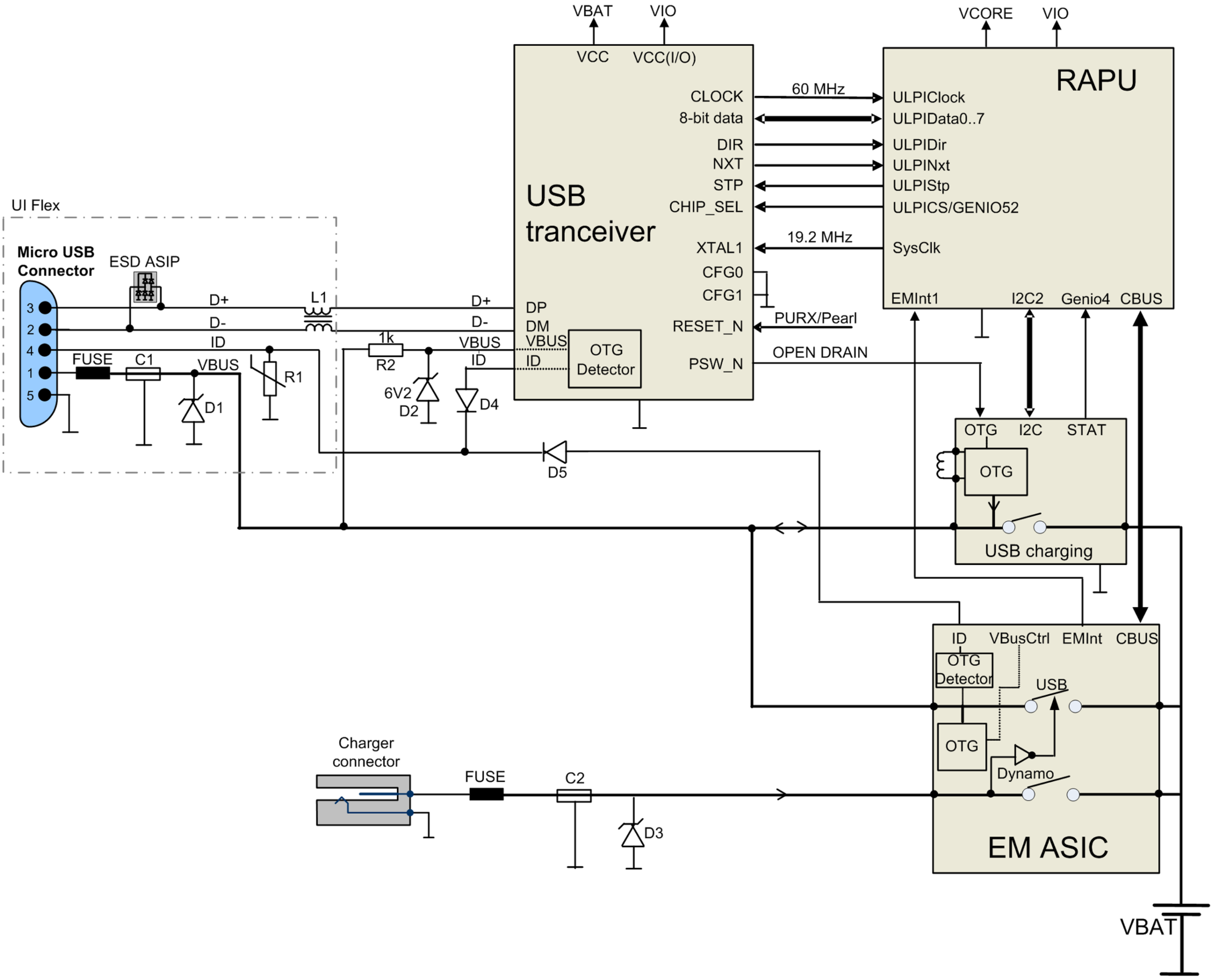

VBAT
VIO
VCC
VCC(I/O)
VCORE
VIO
RAPU
USB tranceiver
CLOCK
8-bit data
DIR
NXT
STP
CHIP_SEL
XTAL1
CFG0
CFG1
RESET_N
PSW_N
60 MHz
19.2 MHz
ULPIClock
ULPIData0..7
ULPIDir
ULPINxt
ULPIStp
ULPICS/GENIO52
SysClk
EMInt1
I2C2
Genio4
CBUS
PURX/Pearl
OPEN DRAIN
UI Flex
Micro USB Connector
ESD ASIP
D+
D-
ID
VBUS
FUSE
C1
L1
R1
D1
1k
R2
6V2
D2
D4
D5
DP
DM
VBUS
ID
OTG Detector
OTG
I2C
STAT
OTG
USB charging
ID
VBusCtrl
EMInt
CBUS
OTG Detector
USB
OTG
Dynamo
EM ASIC
Charger connector
FUSE
C2
D3
VBAT

Figure 40 USB interface

The phone supports USB 2.0 with High-Speed (480 Mbps).

Hot swap is supported, which means that USB devices may be plugged in and out at any time.

MicroUSB connector

This phone is provided with a specific connector for microUSB.

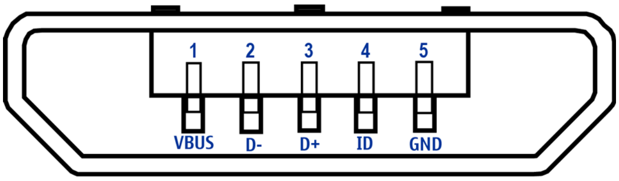

1
2
3
4
5
VBUS
D-
D+
ID
GND

Figure 41 MicroUSB connector

User interface

Display interface

The following block diagram illustrates the display interface. Command signals and transmitted data to the display module comes directly from RAPU.

Display backlight is provided by an external LED driver.

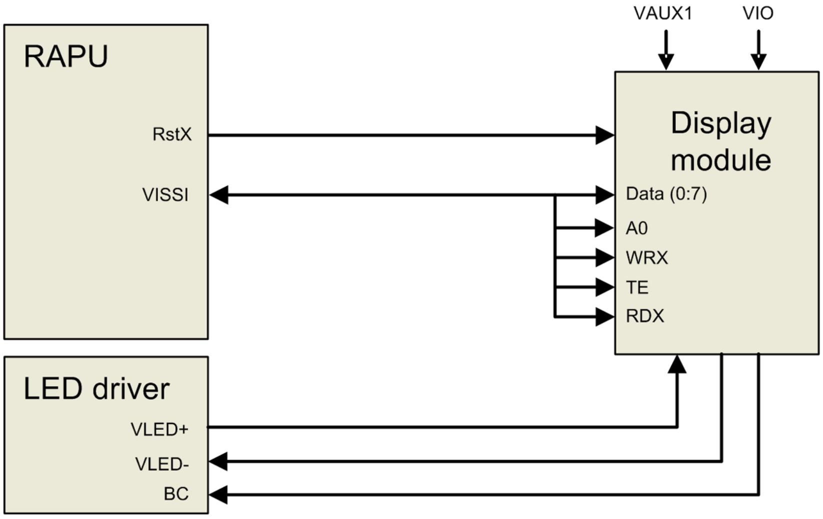

VAUX1
VIO
RAPU
RstX
VISSI
Display module
Data (0:7)
A0
WRX
TE
RDX
LED driver
VLED+
VLED-
BC

Figure 42 Display interface

Keyboard interface

The following block diagram shows the keyboard interface. The keyboard interface contains an IO expander that is controlled by the I2C bus. The IO expander scans:

- The main keyboard
- The capture key
- The two volume keys

Decoupling components are implemented between the IO expander and the keys. When a key is pressed, an interrupt is sent to RAPU.

Side keys at the UI keymat are connected directly to the RAPU GENIOs.

The LEDs at the main keyboard are controlled by a LED driver. The driver is controlled by the I2C bus.

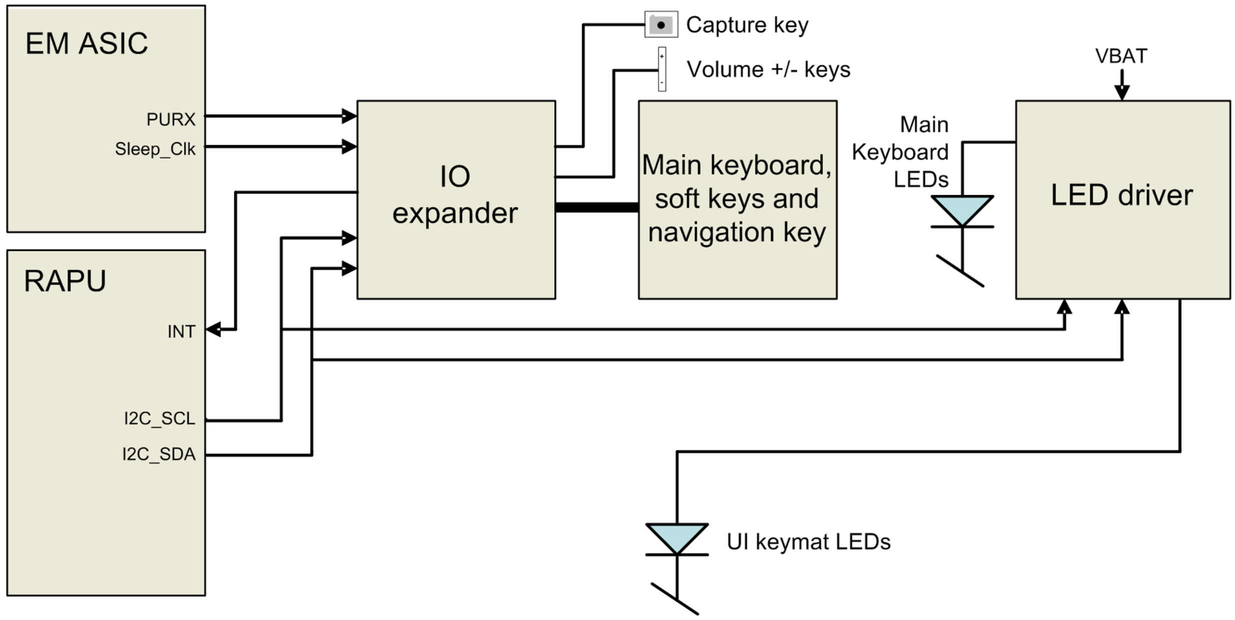

EM ASIC
PURX
Sleep_Clk
RAPU
INT
I2C_SCL
I2C_SDA
IO expander
Capture key
Volume +/- keys
Main keyboard, soft keys and navigation key
Main Keyboard LEDs
VBAT
LED driver
UI keymat LEDs

Figure 43 Keyboard interface

Ambient light sensor (ALS) interface

Ambient light sensor information is used to control keyboard and display brightness.

- Keyboard backlight is turned OFF, when it is not needed.
- Display brightness is dimmed, when environment lighting is dark.

The ambient light sensor is calibrated in production and can be re-tuned in service points, though not recommended unless calibration coefficient is lost for some reason

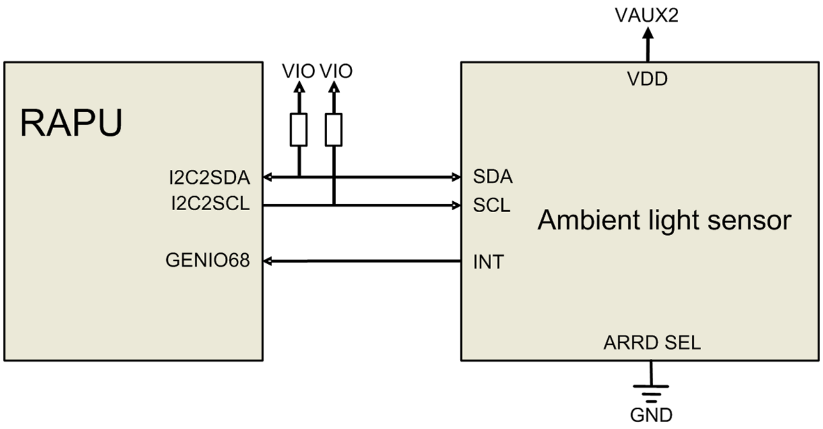

VAUX2
RAPU
VIO VIO
I2C2SDA
I2C2SCL
GENIO68
VDD
SDA
SCL
INT
Ambient light sensor
ARRD SEL
GND

Figure 44 Ambient light sensor (ALS) interface

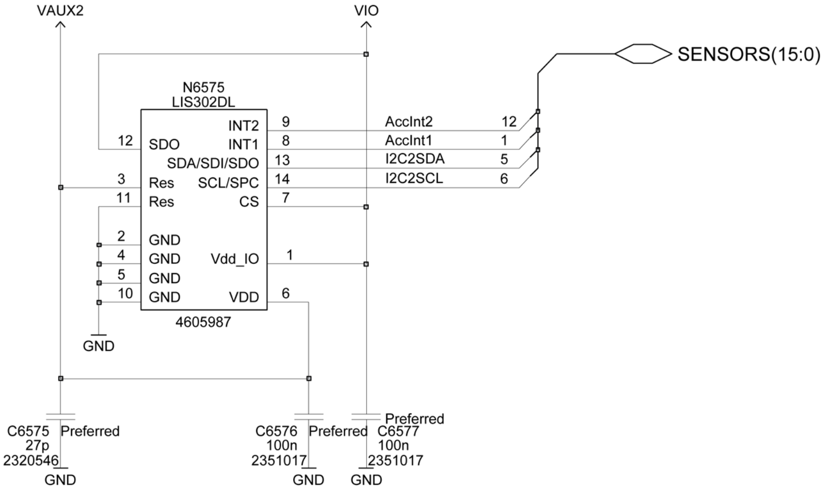
Accelerometer

The accelerometer measures the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion or shock.

It has the following features:

- 2.4V to 3.6V supply voltage
- 1.8V compatible IOs
- low power consumption
- I2C output interface

The accelerometer (N6575) is connected to I2C. One GENIO is reserved for interrupt triggered by tap commands.


VAUX2
VIO
SENSORS(15:0)
N6575
LIS302DL
INT2
SDO
INT1
SDA/SDI/SDO
Res
SCL/SPC
Res
CS
GND
GND
Vdd_IO
GND
GND
VDD
4605987
12
3
11
2
4
5
10
9
8
13
14
7
1
6
AccInt2
AccInt1
I2C2SDA
I2C2SCL
12
1
5
6
GND
C6575
27p
2320546
Preferred
GND
C6576
100n
2351017
Preferred
GND
Preferred
C6577
100n
2351017
GND

GPS interface

The phone includes a built in GPS receiver and could operate as a stand-alone positioning device. The antenna for GPS is located at the top of the A-cover, see section GPS antenna (page 5– 0).

The GPS receiver is connected to RAPU ASIC.

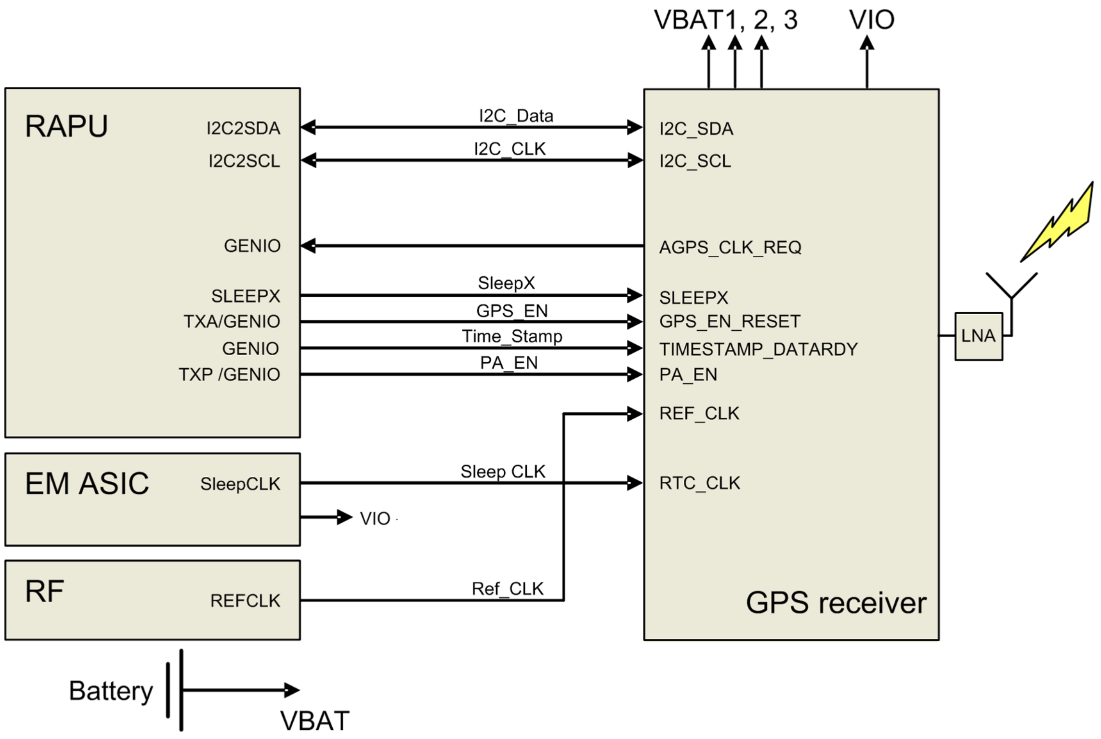

VBAT1, 2, 3
VIO
RAPU
I2C2SDA
I2C2SCL
GENIO
SLEEPX
TXA/GENIO
GENIO
TXP /GENIO
I2C_Data
I2C_CLK
SleepX
GPS_EN
Time_Stamp
PA_EN
I2C_SDA
I2C_SCL
AGPS_CLK_REQ
SLEEPX
GPS_EN_RESET
TIMESTAMP_DATARDY
PA_EN
REF_CLK
RTC_CLK
LNA
EM ASIC
SleepCLK
Sleep CLK
VIO
RF
REFCLK
Ref_CLK
GPS receiver
Battery
VBAT

Figure 45 GPS interface

Camera interface

In this phone the camera and the camera flash driver are connected directly to RAPU and controlled by the I2C bus, port 0. The camera is supplied by separate voltage regulators enabled by the camera software (GENIOs).

Control signals to and from the camera flash driver are connected directly to RAPU (GENIOs).

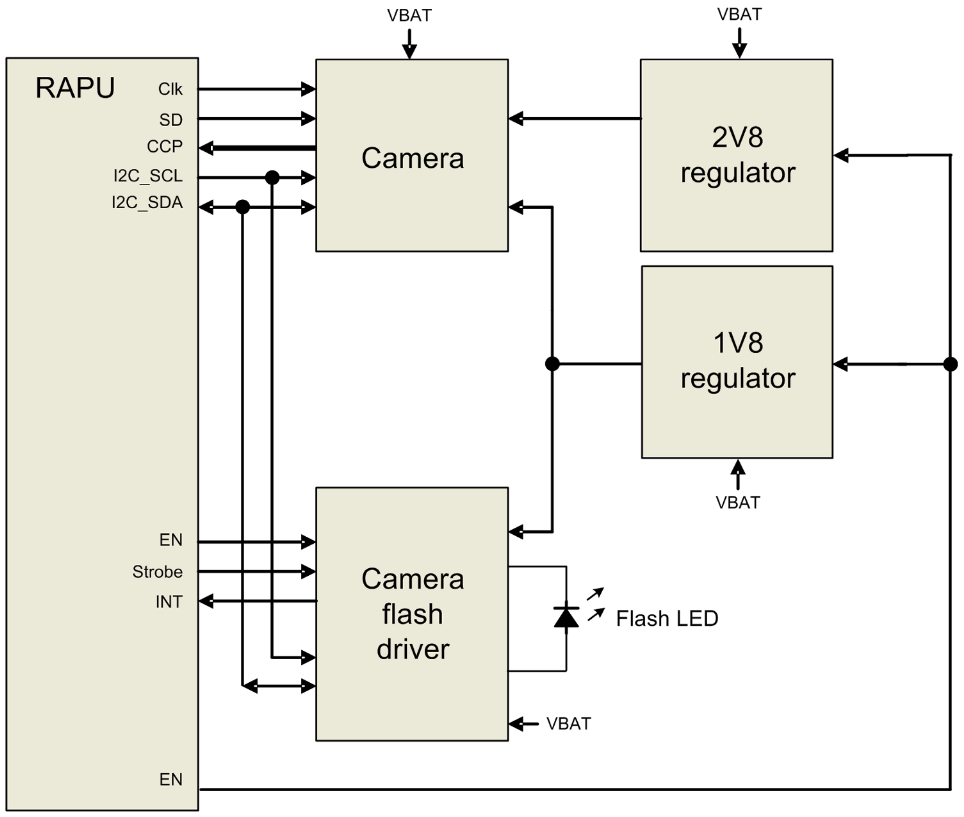

VBAT
VBAT
RAPU
Clk
SD
CCP
I2C_SCL
I2C_SDA
Camera
2V8
regulator
1V8
regulator
VBAT
EN
Strobe
INT
Camera
flash
driver
Flash LED
VBAT
EN

Figure 46 Camera interface

Audio interface

The following block diagram illustrates the audio interface of the phone:

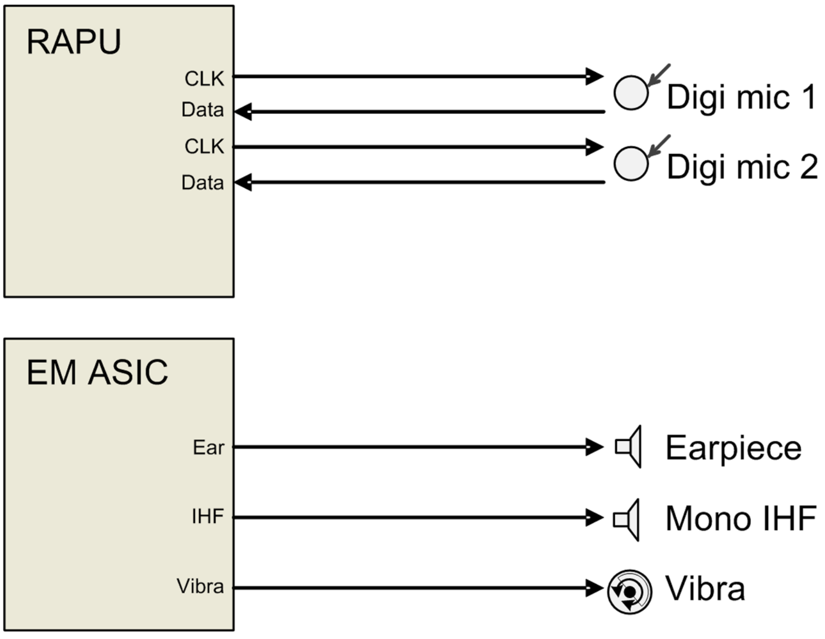

RAPU
CLK
Data
CLK
Data
Digi mic 1
Digi mic 2
EM ASIC
Ear
IHF
Vibra
Earpiece
Mono IHF
Vibra

Figure 47 Audio interface

The two digital microphones, Digi mic 1 and Digi mic 2, are connected directly to RAPU.

The earpiece is driven directly by a built-in amplifier included in EM ASIC.

The IHF speaker is driven directly by a built-in stereo amplifier included in EM ASIC.

The vibra is driven directly by a built-in amplifier included in EM ASIC.

Bluetooth interface

Bluetooth provides a fully digital link for communication between a master unit (the phone) and one or more slave units (e.g. a wireless headset). Data and control interface for a low power RF module is provided by the BTHFM module.

Bluetooth is physically integrated with FM radio in the BTHFM module ASIC, but from a functional point of view they have nothing in common

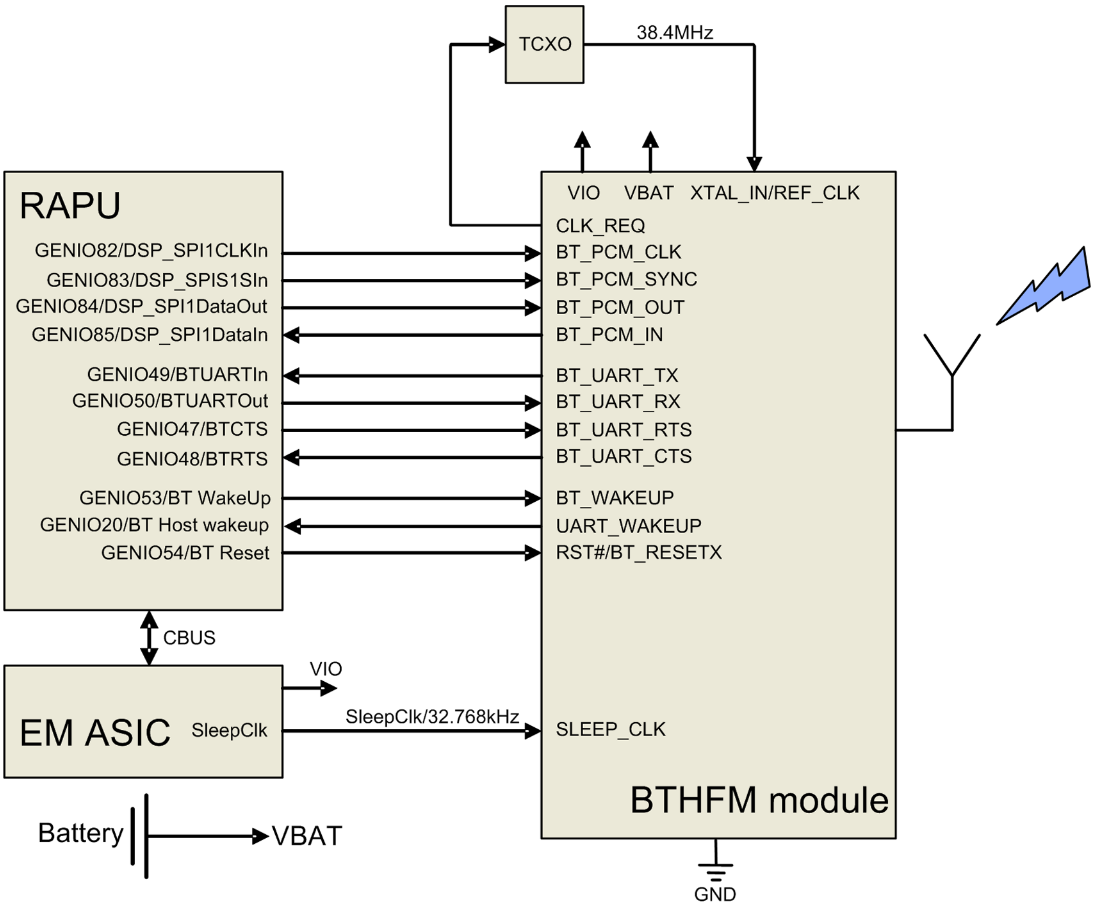

TCXO
38.4MHz
RAPU
GENIO82/DSP_SPI1CLKIn
GENIO83/DSP_SPIS1SIn
GENIO84/DSP_SPI1DataOut
GENIO85/DSP_SPI1DataIn
GENIO49/BTUARTIn
GENIO50/BTUARTOut
GENIO47/BTCTS
GENIO48/BTRTS
GENIO53/BT WakeUp
GENIO20/BT Host wakeup
GENIO54/BT Reset
VIO
VBAT
XTAL_IN/REF_CLK
CLK_REQ
BT_PCM_CLK
BT_PCM_SYNC
BT_PCM_OUT
BT_PCM_IN
BT_UART_TX
BT_UART_RX
BT_UART_RTS
BT_UART_CTS
BT_WAKEUP
UART_WAKEUP
RST#/BT_RESETX
CBUS
VIO
EM ASIC
SleepClk
SleepClk/32.768kHz
SLEEP_CLK
BTHFM module
Battery
VBAT
GND

Figure 48 Bluetooth interface

The BTHFM module is powered by VBAT and the regulated voltage VIO. For audio applications the Bluetooth has a PCM data bus. In addition an UART (universal asynchronous receiver/transmitter) is used for data communication and controls.

Bluetooth shares the antenna with WLAN.

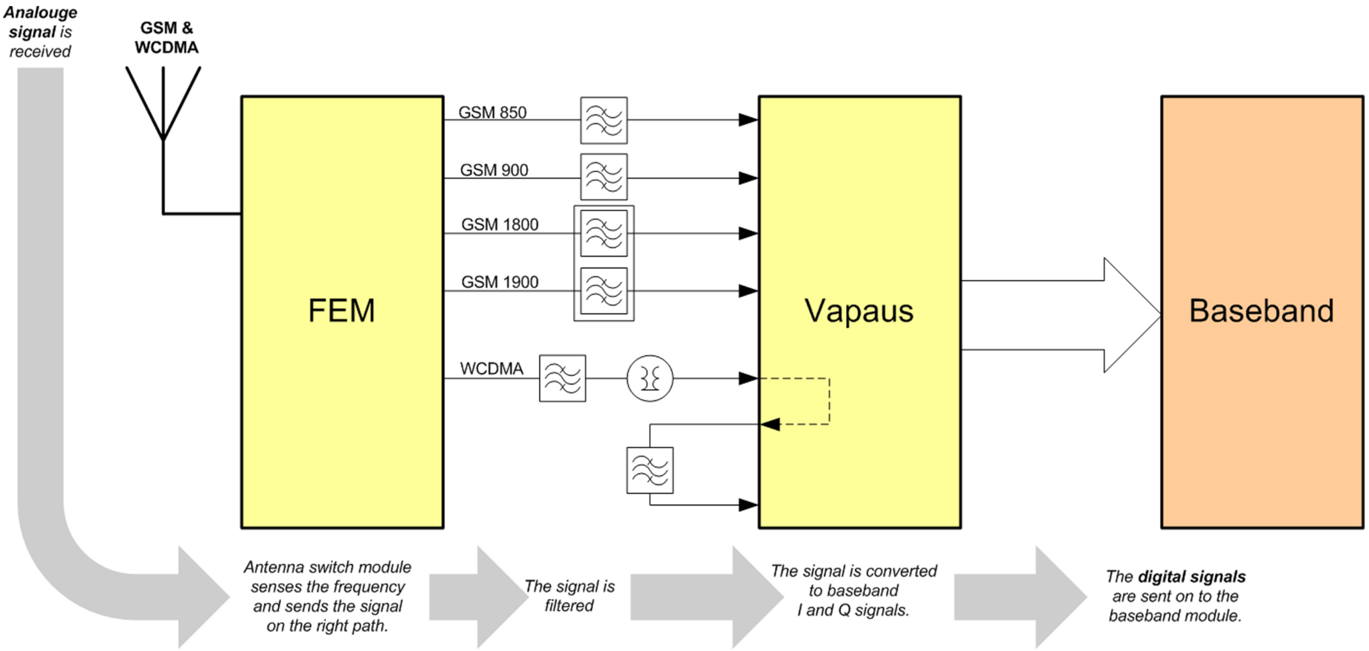
RF description

Receiver (RX)

An analogue signal is received by the phone's antenna. The signal is converted to a digital signal and is then transferred further to the baseband (e.g. to the earpiece).

The receiver functions are implemented in the RF ASIC.

Signals with different frequencies take different paths, therefore being handled by different components. The principle of GSM and WCDMA is the same.

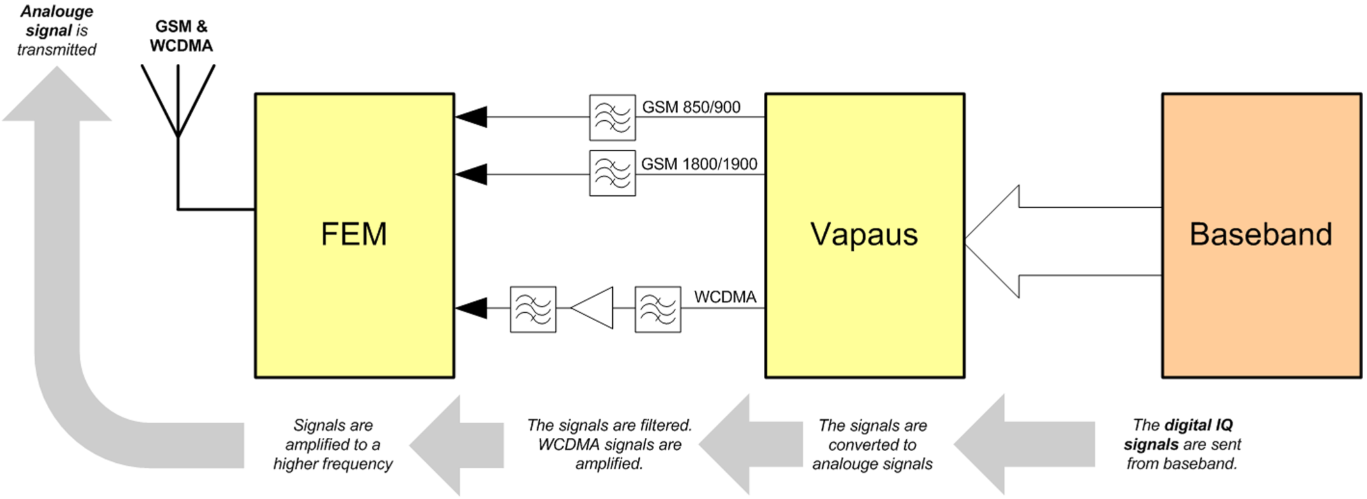

Analouge signal is received
GSM & WCDMA
FEM
GSM 850
GSM 900
GSM 1800
GSM 1900
WCDMA
Vapaus
Baseband
Antenna switch module senses the frequency and sends the signal on the right path.
The signal is filtered
The signal is converted to baseband I and Q signals.
The digital signals are sent on to the baseband module.

Transmitter (TX)

The digital baseband signal (e.g. from the microphone) is converted to an analogue signal, which is then amplified and transmitted from the antenna. The frequency of this signal can be tuned to match the bandwith of the system in use (e.g. GSM900).

The transmitter functions are implemented in the RF ASIC.

Even though the GSM and WCDMA signals are sent via different components, the principle of the transmission is the same.


Analouge signal is transmitted
GSM & WCDMA
FEM
GSM 850/900
GSM 1800/1900
WCDMA
Vapaus
Baseband
Signals are amplified to a higher frequency
The signals are filtered. WCDMA signals are amplified.
The signals are converted to analouge signals
The digital IQ signals are sent from baseband.

Glossary

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A/D-converter	Analogue-to-digital converter
ACI	Accessory Control Interface
ADC	Analogue-to-digital converter
ADSP	Application DPS (expected to run high level tasks)
AGC	Automatic gain control (maintains volume)
ALS	Ambient light sensor
AMSL	After Market Service Leader
ARM	Advanced RISC Machines
ARPU	Average revenue per user (per month or per year)
ASIC	Application Specific Integrated Circuit
ASIP	Application Specific Interface Protector
B2B	Board to board, connector between PWB and UI board
BA	Board Assembly
BB	Baseband
BC02	Bluetooth module made by CSR
BIQUAD	Bi-quadratic (type of filter function)
BSI	Battery Size Indicator
BT	Bluetooth
CBus	MCU controlled serial bus connected to UPP_WD2, UEME and Zocus
CCP	Compact Camera Port
CDMA	Code division multiple access
CDSP	Cellular DSP (expected to run at low levels)
CLDC	Connected limited device configuration
CMOS	Complimentary metal-oxide semiconductor circuit (low power consumption)
COF	Chip on Foil
COG	Chip on Glass
CPU	Central Processing Unit
CSD	Circuit-switched data
CSR	Cambridge silicon radio
CSTN	Colour Super Twisted Nematic
CTSI	Clock Timing Sleep and interrupt block of Tiku
CW	Continuous wave
D/A-converter	Digital-to-analogue converter
DAC	Digital-to-analogue converter
DBI	Digital Battery Interface
DBus	DSP controlled serial bus connected between UPP_WD2 and Helgo

DCT-4	Digital Core Technology
DMA	Direct memory access
DP	Data Package
DPLL	Digital Phase Locked Loop
DSP	Digital Signal Processor
DTM	Dual Transfer Mode
DtoS	Differential to Single ended
EDGE	Enhanced data rates for global/GSM evolution
EGSM	Extended GSM
EM	Energy management
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
ESD	Electrostatic discharge
FCI	Functional cover interface
FPS	Flash Programming Tool
FR	Full rate
FSTN	Film compensated super twisted nematic
GMSK	Gaussian Minimum Shift Keying
GND	Ground, conductive mass
GPIB	General-purpose interface bus
GPRS	General Packet Radio Service
GSM	Group Special Mobile/Global System for Mobile communication
HSDPA	High-speed downlink packet access
HF	Hands free
HFCM	Handsfree Common
HS	Handset
HSCSD	High speed circuit switched data (data transmission connection faster than GSM)
HW	Hardware
I/O	Input/Output
IBAT	Battery current
IC	Integrated circuit
ICHAR	Charger current
IF	Interface
IHF	Integrated hands free
IMEI	International Mobile Equipment Identity
IR	Infrared

IrDA	Infrared Data Association
ISA	Intelligent software architecture
JPEG/JPG	Joint Photographic Experts Group
LCD	Liquid Crystal Display
LDO	Low Drop Out
LED	Light-emitting diode
LPRF	Low Power Radio Frequency
MCU	Micro Controller Unit (microprocessor)
MCU	Multiport control unit
MIC, mic	Microphone
MIDP	Mobile Information Device Profile
MIN	Mobile identification number
MIPS	Million instructions per second
MMC	Multimedia card
MMS	Multimedia messaging service
MTP	Multipoint-to-point connection
NFC	Near field communication
NTC	Negative temperature coefficient, temperature sensitive resistor used as a temperature sensor
OMA	Object management architecture
OMAP	Operations, maintenance, and administration part
Opamp	Operational Amplifier
PA	Power amplifier
PDA	Pocket Data Application
PDA	Personal digital assistant
PDRAM	Program/Data RAM (on chip in Tiku)
Phoenix	Software tool of DCT4.x and BB5
PIM	Personal Information Management
PLL	Phase locked loop
PM	(Phone) Permanent memory
PUP	General Purpose IO (PIO), USARTS and Pulse Width Modulators
PURX	Power-up reset
PWB	Printed Wiring Board
PWM	Pulse width modulation
RC-filter	Resistance-Capacitance filter
RF	Radio Frequency

RF PopPort™	Reduced function PopPort™ interface
RFBUS	Serial control Bus For RF
RSK	Right Soft Key
RS-MMC	Reduced size Multimedia Card
RSS	Web content Syndication Format
RSSI	Receiving signal strength indicator
RST	Reset Switch
RTC	Real Time Clock (provides date and time)
RX	Radio Receiver
SARAM	Single Access RAM
SAW filter	Surface Acoustic Wave filter
SDRAM	Synchronous Dynamic Random Access Memory
SID	Security ID
SIM	Subscriber Identity Module
SMPS	Switched Mode Power Supply
SNR	Signal-to-noise ratio
SPR	Standard Product requirements
SRAM	Static random access memory
STI	Serial Trace Interface
SW	Software
SWIM	Subscriber/Wallet Identification Module
TCP/IP	Transmission control protocol/Internet protocol
TCXO	Temperature controlled Oscillator
Tiku	Finnish for Chip, Successor of the UPP
TX	Radio Transmitter
UART	Universal asynchronous receiver/transmitter
UEME	Universal Energy Management chip (Enhanced version)
UEMEK	See UEME
UI	User Interface
UPnP	Universal Plug and Play
UPP	Universal Phone Processor
UPP_WD2	Communicator version of DCT4 system ASIC
USB	Universal Serial Bus
VBAT	Battery voltage
VCHAR	Charger voltage
VCO	Voltage controlled oscillator

VCTCXO	Voltage Controlled Temperature Compensated Crystal Oscillator
VCXO	Voltage Controlled Crystal Oscillator
VF	View Finder
Vp-p	Peak-to-peak voltage
VSIM	SIM voltage
WAP	Wireless application protocol
WCDMA	Wideband code division multiple access
WD	Watchdog
WLAN	Wireless local area network
XHTML	Extensible hypertext markup language
Zocus	Current sensor (used to monitor the current flow to and from the battery)

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